brother®

ELECTRONIC TYPEWRITER
SERVICE MANUAL(AX-δ SERIES)

MODEL:AX-325 / GX-6750
:AX-310

MECHANISM & ELECTRONICS

Electronic Typewriter Service Manual
(Mechanical Part)

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CHAPTER I THEORY OF OPERATION

GENERAL

The machines of the AX-325,GX-6750 and AX-310 typewriters can be divided into the following three units.

<Carrier Unit>

Printing mechanism

Ribbon feed mechanism

Correction mechanism

Head holder drive mechanism

Clutch switching mechanism

Paper meter mechanism

<Paper Feed Unit>

Paper feed mechanism

Platen mechanism

Paper release mechanism

<Other mechanism>

Index switch actuator

Keyboard

1. PRINTING MECHANISM

The printing mechanism incorporates a daisy wheel motor (stepping motor) which drives and positions a 96-character daisy wheel and a print hammer which strikes a selected character against the platen.

This mechanism is built in the head holder which moves in parallel to the platen between the right and left chassis side plates.

1.1. Daisy Wheel Motor

The daisy wheel motor is secured to the daisy wheel motor holder with two screws. The daisy wheel cartridge release lever is used to lock the daisy wheel motor holder in the printing position and to release it to allow a daisy wheel cartridge to be changed.

The daisy wheel motor gear fitted to the daisy wheel motor meshes with the daisy wheel gear which is mounted to the daisy wheel motor holder and is fitted with the daisy wheel subsidiary gear and finally a daisy wheel.

The home position of the daisy wheel motor is indexed by the PW home position lever and the daisy wheel gear. When the daisy wheel motor is in the home position, the spoke for comma "," is selected.

Fig. 1.1 shows the relative dimensions of the daisy wheel gear,head guide shaft, and head holder rail guide when the daisy wheel gear and the daisy wheel motor holder are mounted on the head holder with the daisy wheel gear shaft in the level position.

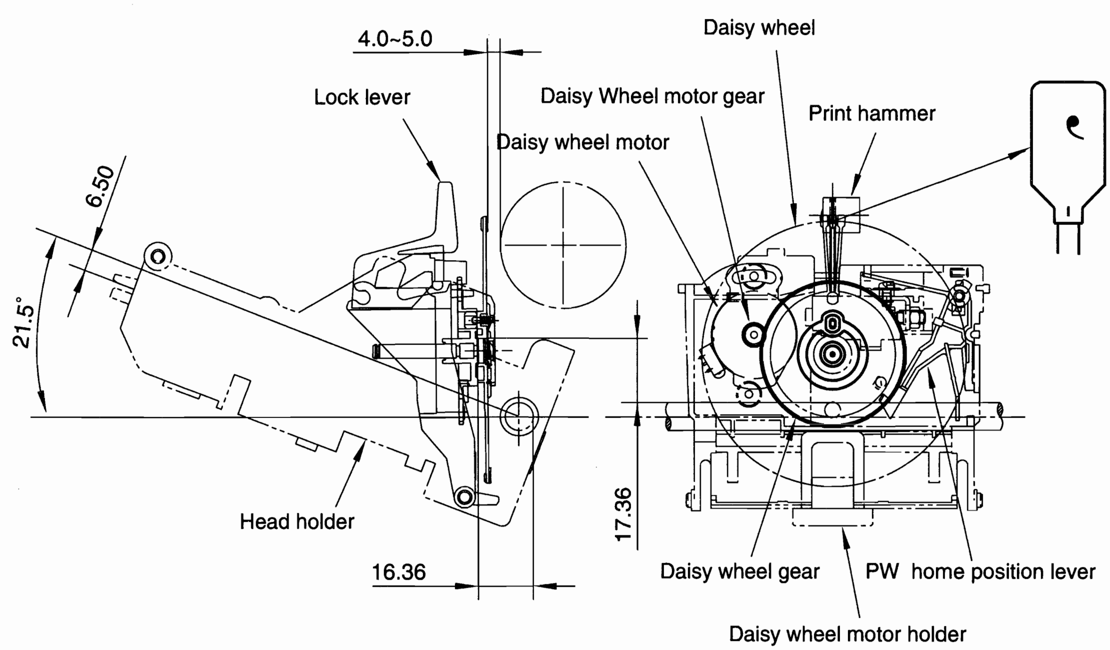


Fig. 1.1

1.2. Print Hammer

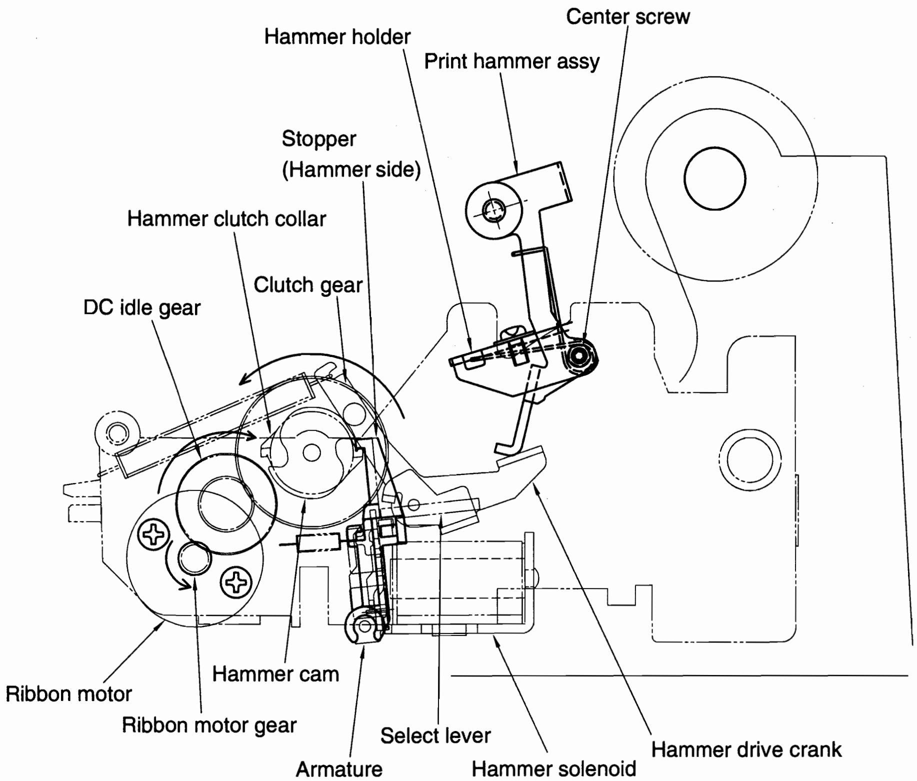


Fig. 1.2

The print hammer assembly is assembled to the hammer holder with a print hammer center screw and the print hammer is driven by a Ribbon motor. The print hammer impact force is provided with two levels. The drive steps are as follows.

(1) When a key on the keyboard is pressed, the Ribbon motor rotates and the ribbon motor gear which is press-fitted to the motor shaft also rotates. The ribbon motor gear rotation is transmitted to the clutch gear via the DC idle gear. When the hammer solenoid is energized, the armature operates and the hammer side stopper selected by the select ever makes interlocked motion so that the hammer clutch collar is released.

The hammer clutch collar is coupled with the hammer cam via the hammer clutch spring and starts rotating together with the clutch gear. When the hammer solenoid is de-energized, the armature and the stopper return to the initial position. (Section 5 describes the clutch switching mechanism.)

(2) The hammer cam consists of a print hammer striking cam and a ribbon feed part. The print hammer striking cam has two levels of displacement. The hammer drive crank is pushed against the surface of the print hammer striking cam by extension spring and makes back and forth movements as the cam rotates.

When the hammer drive crank rides the low of the hammer striking cam, the hammer drive crank kicks up the print hammer by the extension spring force and moves the print hammer toward the platen. The impact force of the print hammer is provided with two levels which change according to the size of the character printed. When the character is large, it is printed by the drives mentioned in (1) and (2). (Fig. 1.3) When the character is small, the energized state of the hammer solenoid in the first stage (mentioned in (1)) is maintained. Since the hammer drive crank is stopped by the stopper which is interlocked with the armature, the print hammer is driven only by the spring force of the crank stroke so that the print impression is weak. (Fig. 1.4) Then, the hammer solenoid is unenergized, and the armature and the stopper will return to the original positions.

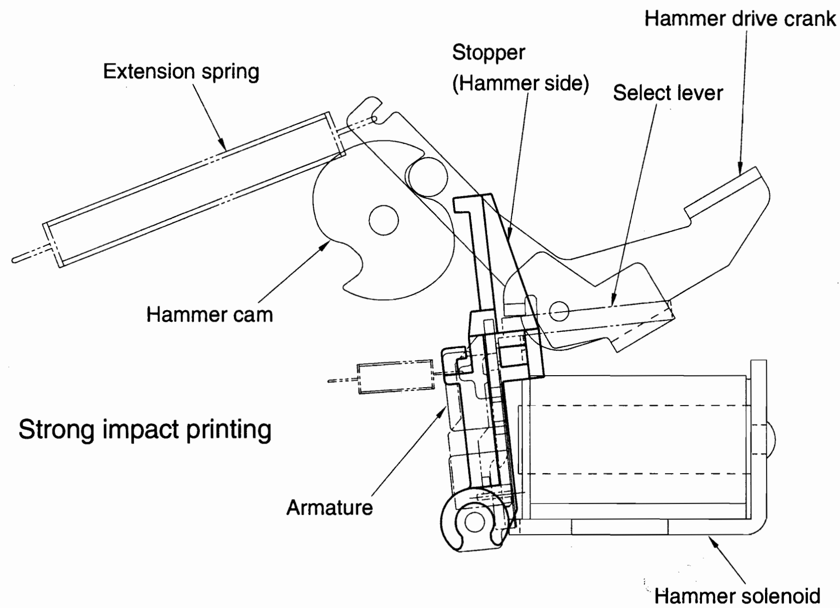


Fig. 1.3

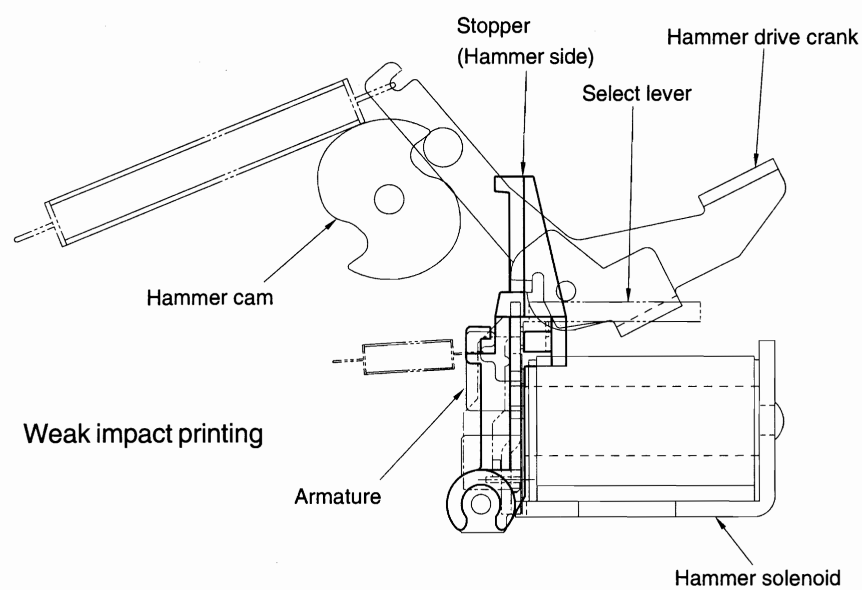


Fig. 1.4

2. RIBBON FEED MECHANISM

Ribbon feeding is performed simultaneously with the print hammer strike operation.

(1) The hammer cam has a high part for ribbon feeding and operates the ribbon feed crank which is attached to the ribbon vibrator when the cam rotates.

(2) The ribbon feed crank turns the ribbon feed ratchet wheel.

(3) Since the ribbon feed ratchet wheel is caught by the Co spring installed the ribbon vibrator after it is turned by the ribbon feed crank by one tooth, it will not make reverse rotation.

(4) The ribbon cassette is connected to the ribbon feed ratchet wheel so that the rotation of the ribbon feed ratchet wheel causes the ribbon to be wound up.

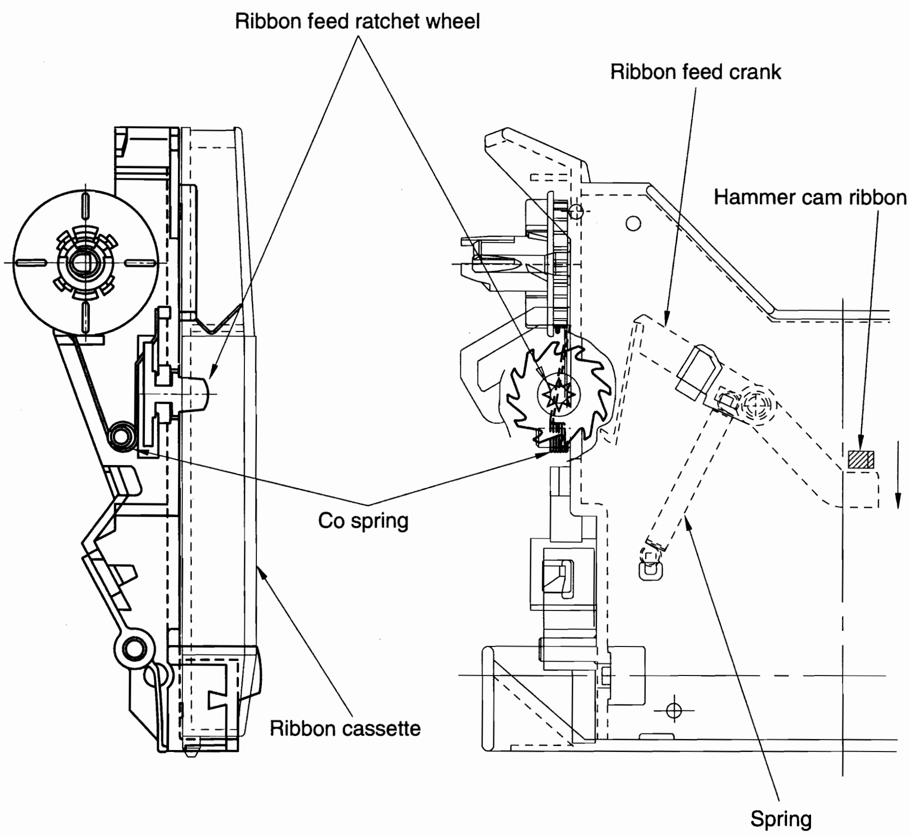


Fig. 1.5

3. CORRECTION MECHANISM

The correction mechanism consists of a vibrator lift mechanism which lifts the correction tape and a correction tape feed mechanism which feeds the correction tape, and is driven by a Ribbon motor.

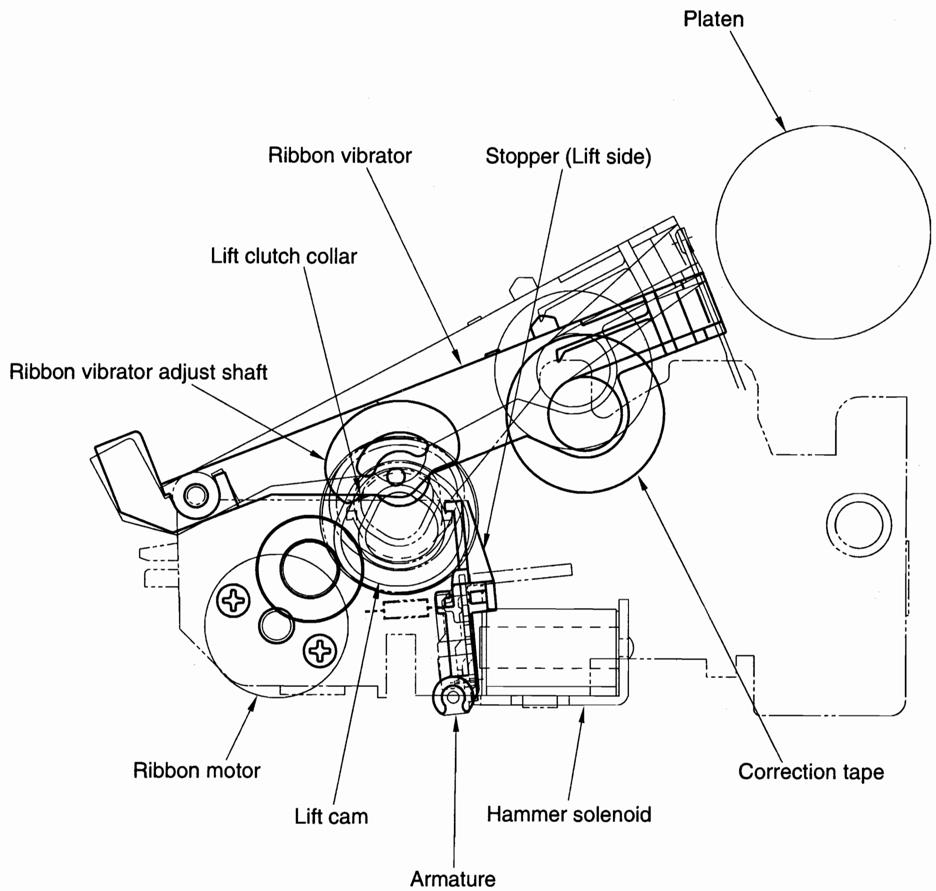


Fig. 1.6

The correction mechanism operates as follows.

(1) Select a character to be erased.

(2) The Ribbon motor rotation is transmitted to the clutch gear as explained in the section of the print hammer. When the hammer solenoid is energized, the armature operates and the lift side stopper selected by the select lever makes interlocked motion so that the lift clutch collar is released.

The lift clutch collar is coupled with the lift cam via the lift clutch spring and starts rotating together with the clutch gear. When the hammer solenoid is de-energized, the armature and the stopper return to the initial position. (Section 5 describes the clutch switching mechanism.)

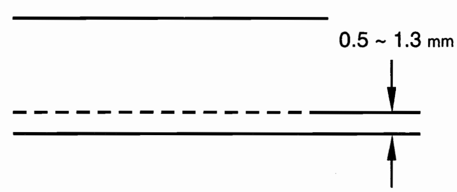
(3) The lift cam groove is engaged with the ribbon vibrator adjust shaft which is mounted to the ribbon vibrator. The clutch collar is stopped by a stopper when it makes a half turn and, in this state, the ribbon vibrator adjust shaft stops at the apex on the lift cam and the ribbon vibrator is in its fully-raised position.

(4) The print hammer strikes four times over the lift tape to erase a character. The ribbon vibrator is held in the fully-raised position while the print hammer is struck.

(5) After the print hammer operated, the select lever is switched to the lift side. When the hammer solenoid is energized again, the armature operates to return the lift cam and the ribbon vibrator to the initial position.

Note: *Check the lifting height of the correction tape as follows.*

Erase an underline "___" using the correction tape and check the position of the underline lifted off to the correction tape. The underline on the correction tape must be positioned at 0.5 to 1.3 mm from the bottom edge of the correction tape.



(Adjustment)

Loosen the ribbon vibrator adjusting shaft fixing screw of the ribbon vibrator, and turn the ribbon vibrator adjust shaft.

(6) Correction tape feed is done by the up and down movements of the ribbon vibrator.

When the ribbon vibrator moves up, the next tooth of the Co spool ratchet wheel is engaged with the correction feed pawl of the head holder. In this state, the Co spool ratchet wheel is stopped by the correction wheel stopper pawl of the ribbon vibrator so that the Co spool ratchet wheel does not make reverse rotation.

When the ribbon vibrator moves down, the correction feed pawl of the head holder makes the Co spool ratchet wheel turn so that the correction tape is wound up.

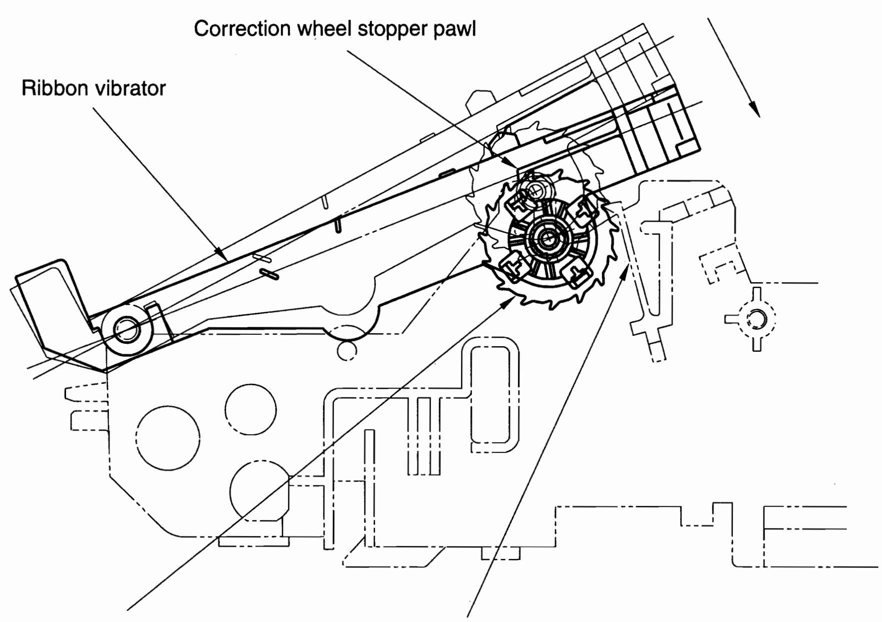


Fig. 1.7

4. HEAD HOLDER DRIVE MECHANISM

Escaping, spacing, backspacing, returning, tabulation, and other operations related to the print head movement are driven by the CA motor.

The carrier drive mechanism consists of a CA motor , a rack and CA intermediate gear.

The CA motor rotation is transmitted to the rack via the CA intermediate gear. The rack is secured to the bottom cover, the CA intermediate gear is mounted to the CA motor holder, and the CA motor holder is mounted to the head holder.

The rotation of the CA intermediate gear mounted to the head holder causes the head holder assembly to slide between the right and left chassis side plates as of the bottom cover guided by the guide shaft and the guide rail. The CA motor holder has a extension spring to eliminate backlash between the CA intermediate gear and the rack.

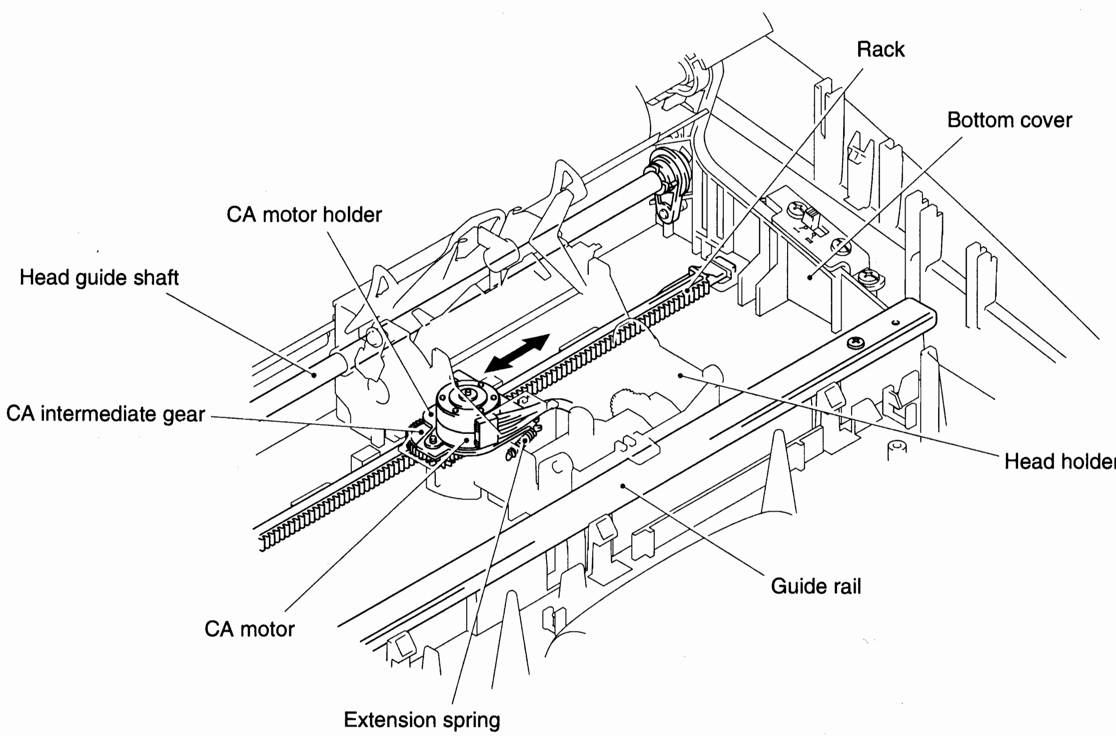


Fig. 1.8

5. CLUTCH SWITCHING MECHANISM

This mechanism enables the clutch operation on the hammer side and the lift side by using one solenoid. The clutch switching operation is performed as follows.

5.1. Hammer clutch side

(1) The head holder assembly moves to the right (forward direction).

(2) The gear installed to the head holder is rotated by the engagement with the rack.

(3) The vibration lever makes clockwise rotation due to the friction with the intermediate gear.(Fig. 1.9-1)

(4) The select lever turns to the left (hammer side).

(5) When the hammer solenoid is energized, the hammer side stopper operates and is released from the hammer clutch collar so that the hammer cam rotates.(Fig. 1.9-2)

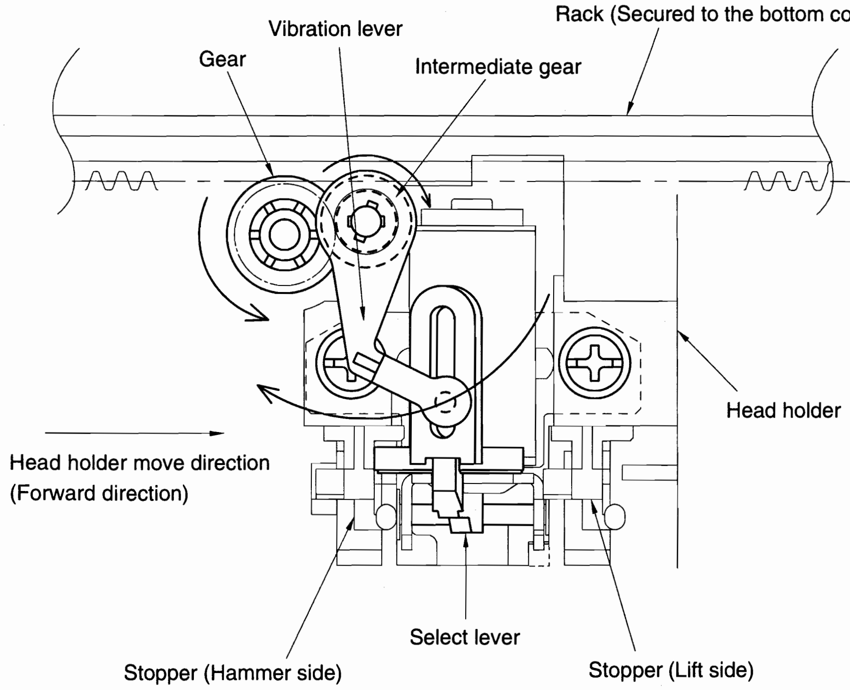


Fig. 1.9-1

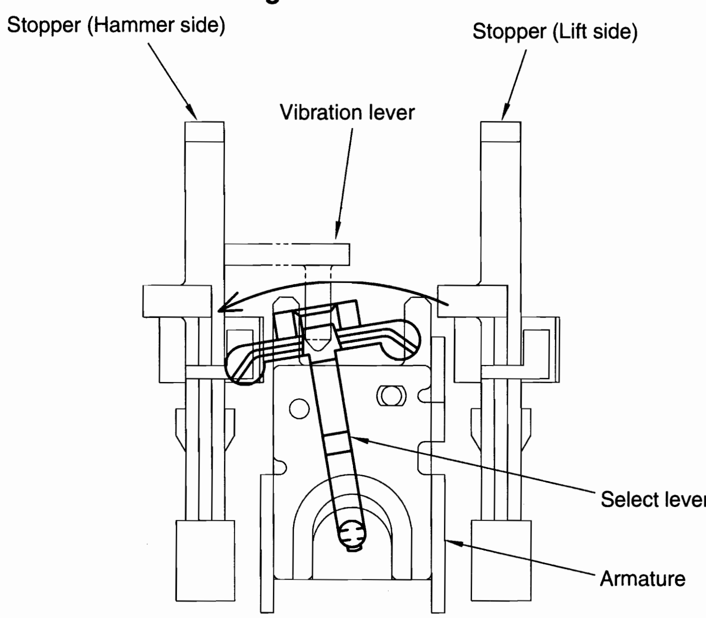


Fig. 1.9-2

5.2. Lift clutch side

(1) The head holder assembly moves to the left (reverse direction).

(2) The gear installed to the head holder is rotated by the engagement with the rack.

(3) The vibration lever makes counter-clockwise rotation due to the friction with the intermediate gear.(Fig. 1.10-1)

(4) The select lever turns to the right (lift side).

(5) When the hammer solenoid is energized, the lift side stopper operates and is released from the lift clutch collar so that the lift cam rotates.(Fig. 1.10-2)

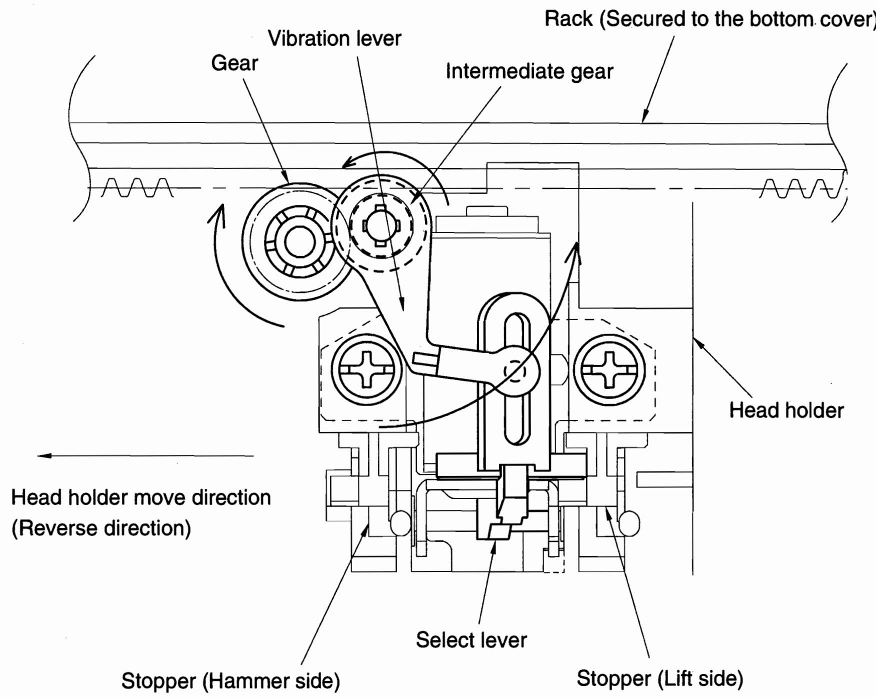


Fig. 1.10-1

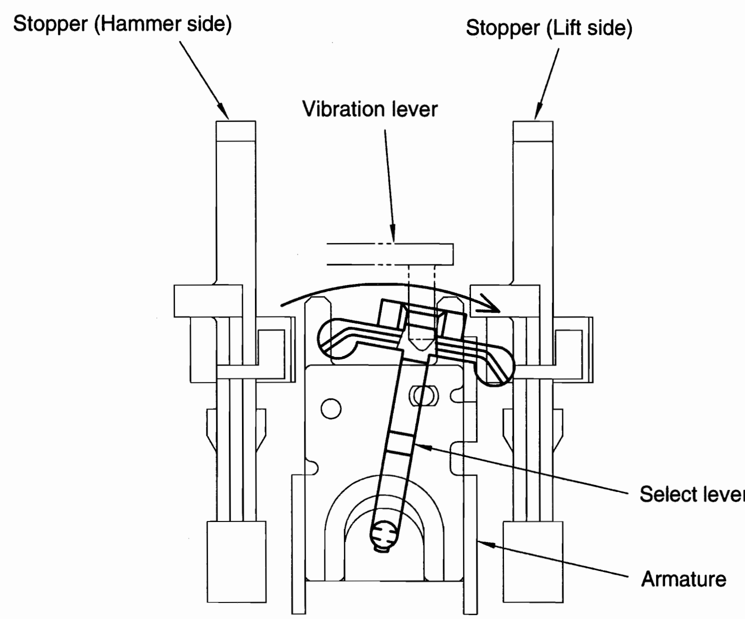


Fig. 1.10-2

6. DAISY WHEEL RELEASE MECHANISM

This mechanism allows a daisy wheel cartridge to be changed. Change a daisy wheel cartridge as follows.

6.1. To release the daisy wheel cartridge:

(1) Open the top cover.

(2) Pull the lock lever to release the daisy wheel motor holder from the lock shaft. The daisy wheel motor holder is retracted to the front by a extension spring.

(3) The daisy wheel gear mounted to the daisy wheel motor holder is retracted so that the daisy wheel cartridge is released.

(4) Pull up the daisy wheel cartridge.

6.2. To set the daisy wheel cartridge:

(1) Insert the daisy wheel cartridge from above between the ribbon guide and the daisy wheel gear.

(2) Push the lock lever toward the daisy wheel cartridge so that the daisy wheel gear is advanced.

(3) The daisy wheel gear is engaged with the daisy wheel cartridge by the force of the daisy wheel clamp spring.

(4) The daisy wheel motor holder is locked to the lock shaft by pushing the lock lever.

(5) Close the top cover.

(6) Press the CODE and Q keys together at the same time to reset the typewriter.

The daisy wheel motor rotates to turn the daisy wheel gear. The daisy wheel rotates together with the daisy wheel gear until the daisy wheel pin strikes the daisy wheel pin stopper of the paper meter assembly. The daisy wheel gear continues to rotate slipping against the daisy wheel until the slot in the daisy wheel gear comes to the pin.

Then, the pin which has been stopped by the pin stopper is engaged with the slot in the daisy wheel gear by the spring force. The daisy wheel is now engaged completely with the daisy wheel gear and starts rotating together with the daisy wheel gear. When the head holder assembly moves to the end of the left side and the PW home position lever operates, the daisy wheel gear stops at the home position once, and then, rotates again until it stops in the correct position. The daisy wheel is now positioned correctly so that characters are correctly selected.

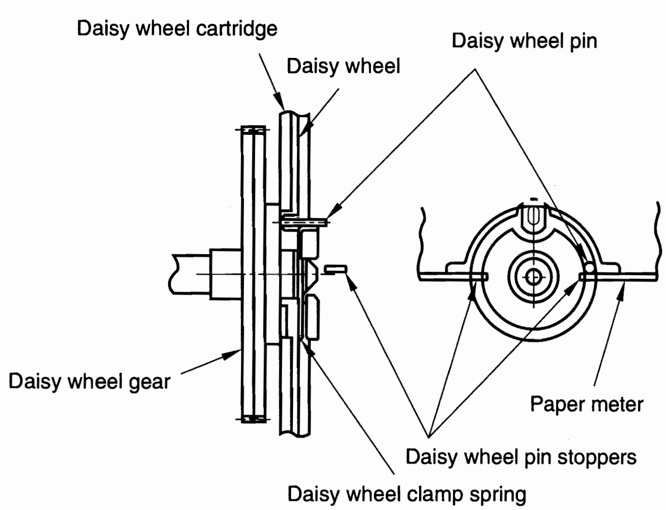


Fig. 1.11

7. PAPER FEED MECHANISM

The platen is driven by a stepping motor (paper feed motor).

The paper feed motor is secured to the LF gear holder with screws, and the LF gear holder is mounted to the bottom cover chassis side plate so that the LF gear holder rotates freely. A extension spring (paper feed gear extension spring) is attached to the LF gear holder so that a spring force is constantly applied in a fixed direction. Rotation of the paper feed motor is transmitted to the paper feed idle gear and then to the platen while a spring force is constantly applied to the platen knob (to eliminate backlash).

Paper feeding is possible by 1/6, 1/4, and 1/3 inches (line spacing by 1, 1-1/2, and 2 lines) and 1/12 inch (for indexing and reverse indexing).

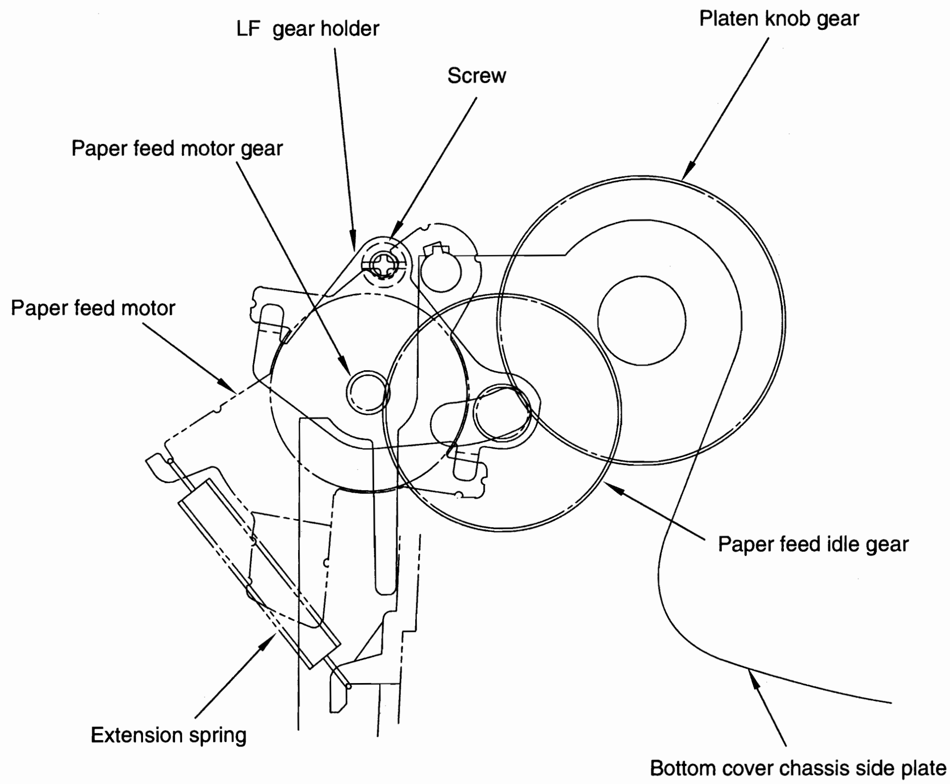


Fig. 1.12

8. PLATEN MECHANISM

Fig. 1.13 shows the platen mechanism. The paper feed motor gear rotation is transmitted to the platen knob to drive the platen.

(Refer to Section 7. Paper Feed Mechanism.)

Note : *When fitting the platen knob, insert it until the platen knob hook engages with the inside of the bottom cover chassis side plate without damaging the paper feed idle gear teeth while pressing the idle gear backwards with a finger, since a rotary force is given to the LF gear holder by a spring.*

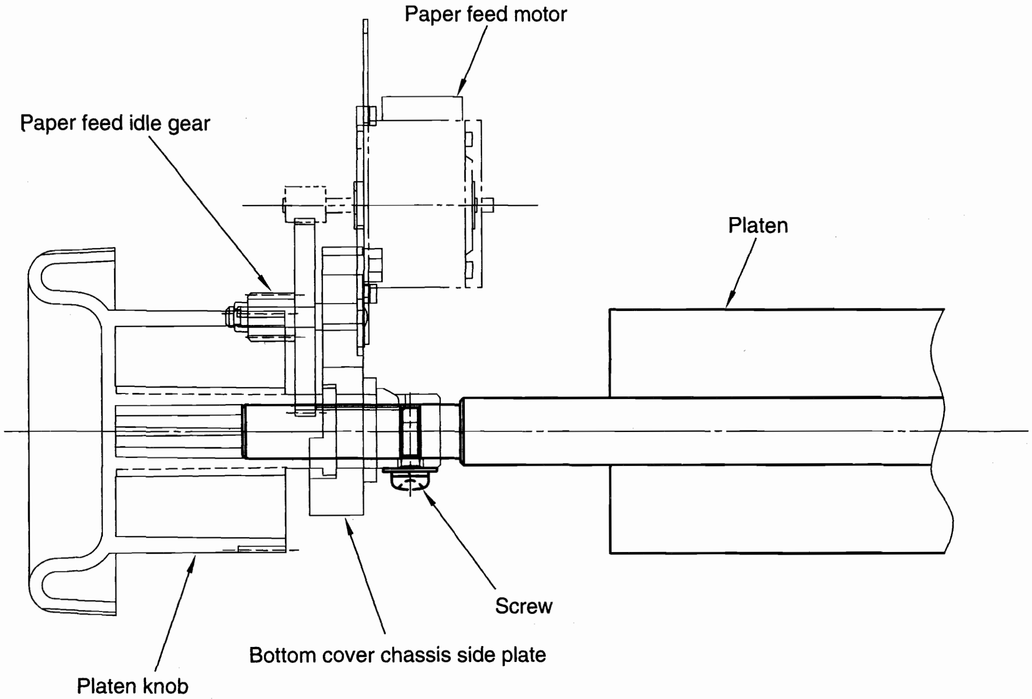


Fig. 1.13

9. PAPER RELEASE MECHANISM

The paper is caught and fed between the platen and the paper hold rollers as the platen rotates. Make sure that both right and left paper hold rollers rotate smoothly and rest on the platen with equal pressure.

If the pressure is not even, adjust by bending the roller shaft bearing (A) of the paper pan. The necessary roller pressure is provided by the paper pan hold plate which pushes up the paper pan at point (B) with the spring on the paper pan hold plate.

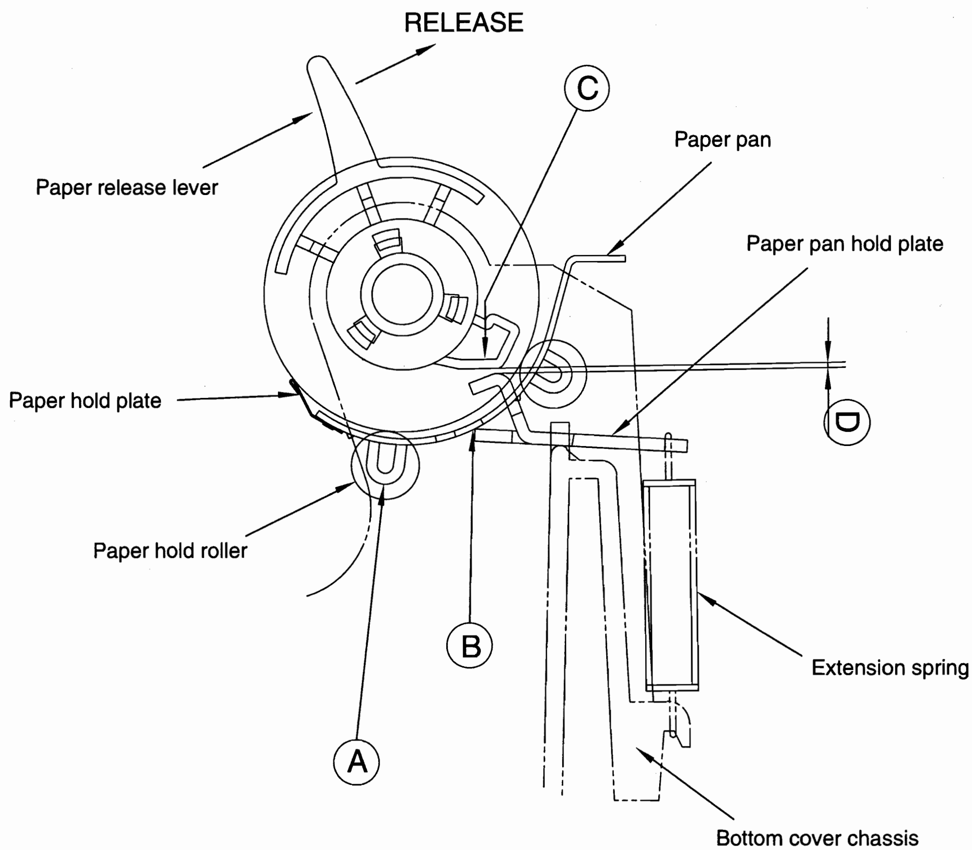


Fig. 1.14

9.1. Paper releasing:

To move the paper on the platen, tilt the paper release lever backwards to make a clearance between the platen and the paper hold rollers with the paper release lever surface (C) pressing down the paper pan hold plate.

To check for appropriate clearance, insert a total of nine sheets of paper (one sheet of QA [Quality A] paper, four sheets of typewriting paper, and four sheets of carbon paper) between the platen and the paper hold rollers and make sure that all sheets of paper can move smoothly.

Note: *Make sure that there is a clearance between the paper release lever and the paper pan hold plate at (D) when the paper release lever is set to the engaged position.*

10. KEYBOARD

10.1. UK Production Model

The key tops and the key stems are assembled in the keyboard panel. The FPC (flexible printed circuit) board with rubber springs is fitted onto the base plate.

The rubber spring is a rubber part with a conductive rubber sponge and is bonded onto the keyboard PCB. The FPC is a single sheet of film on which electrode patterns are printed. When the key top is pressed down, the key stem presses the rubber spring; the contact part (conductive part) connects the both of electrodes to output the signal predetermined for each key.

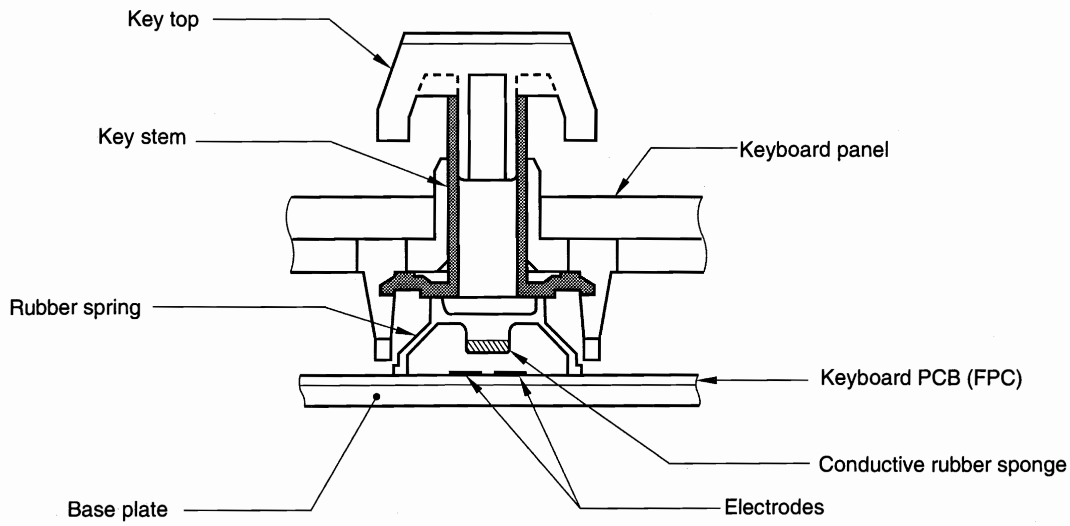


Fig. 1.15-1

10.2. USA Production Model

The key tops and the key stems are assembled in the keyboard panel. The FPC (flexible printed circuit) board and the film with the rubber springs are fitted onto the base plate.

The rubber spring is a rubber part with a conductive rubber sponge and is bonded onto the rubber spring film. The FPC is a single sheet of film on which electrode patterns are printed. When the key top is pressed down, the key stem presses the rubber spring ; the contact part (conductive part) connects the both of electrodes to output the signal predetermined for each key.

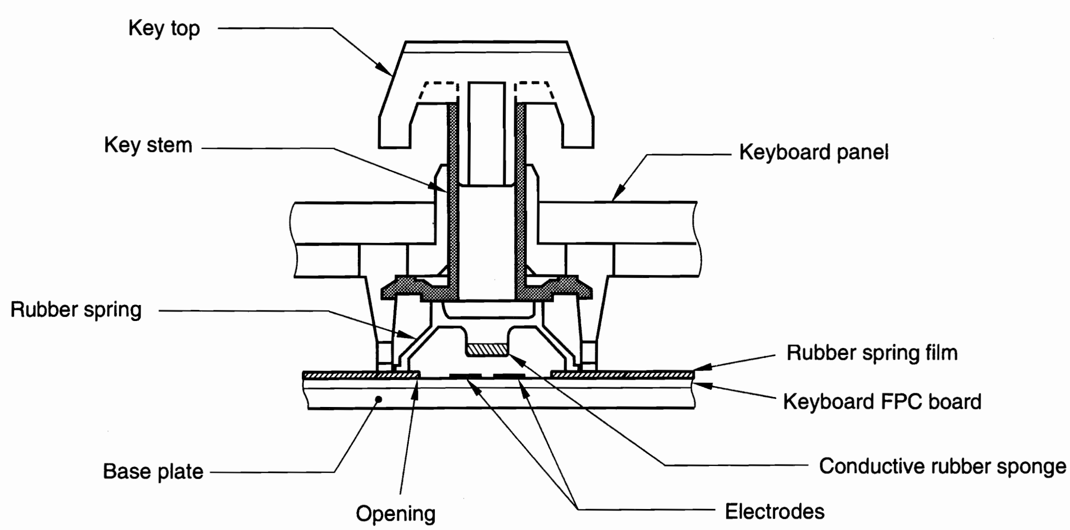


Fig. 1.15-2

11. INDEX SWITCH ACTUATOR

The head holder home position detection is performed when the power is turned on, when the daisy wheel is changed, etc. The index switch actuator installed to the keyboard panel operates when it is pushed by the ribbon vibrator. This actuator detects the head holder position when the head holder is in the left end position on the chassis, and also detects the ribbon vibrator position when it is in the pop-up position.

Fig. 1.16-1 and Fig. 1.16-2 shows the operation steps and the index switch on/off ranges. Fig. 1.17 shows the Indexing mechanism.

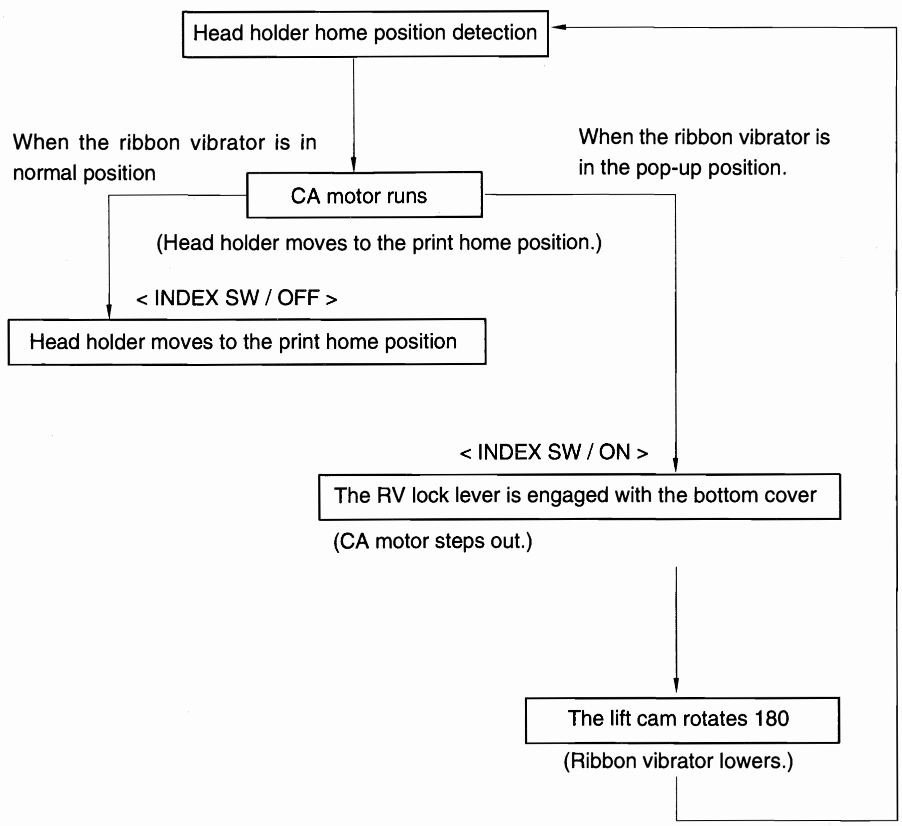


Fig. 1.16-1

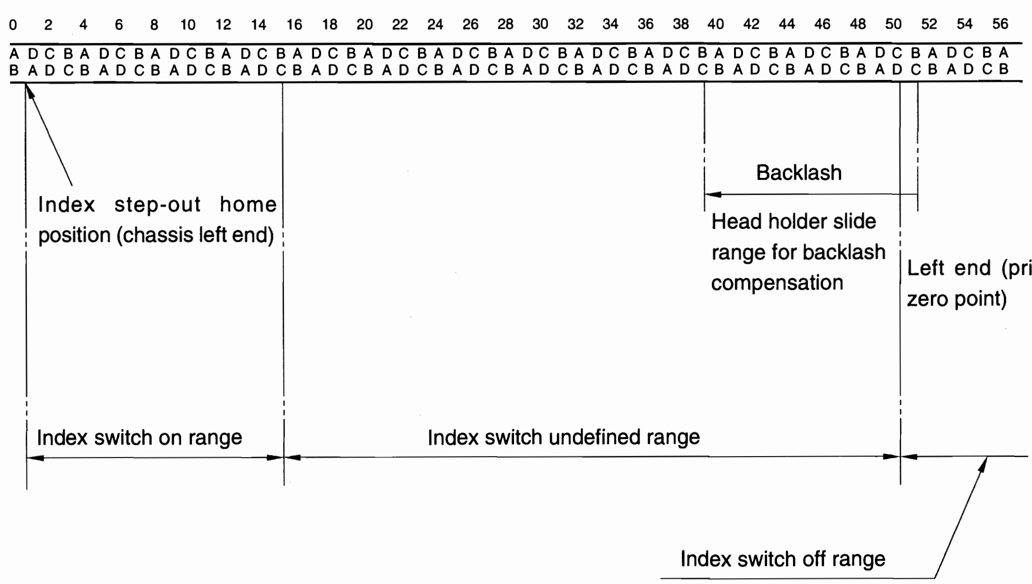


Fig. 1.16-2

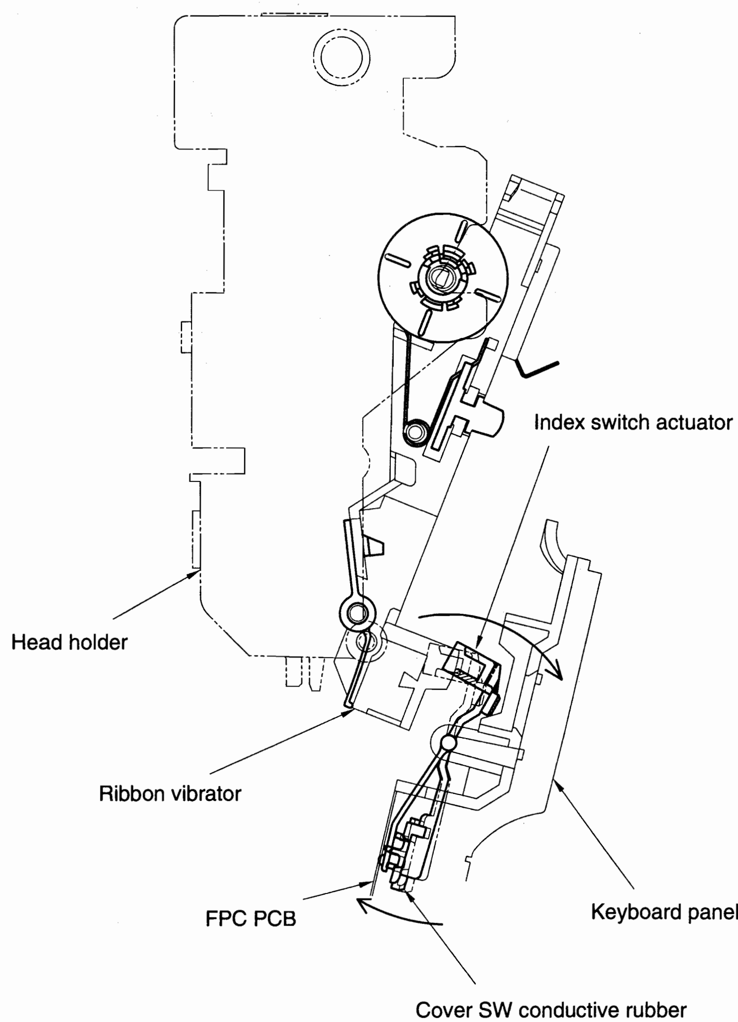

Index switch actuator
Head holder
Ribbon vibrator
FPC PCB
Keyboard panel
Cover SW conductive rubber

Fig. 1.17

When the ribbon vibrator is in the pop-up position and the head holder home position is detected, the RV lock lever installed to the ribbon vibrator is engaged with the bottom cover lock to prevent the head holder from moving to the print home position . (The CA motor become out of step.)

When the index switch is turned on, the pop-up position of the ribbon vibrator is detected. (For the details of the operation, refer to Section 3.13 Home Position Indexing Operation in the Electronic Part.)

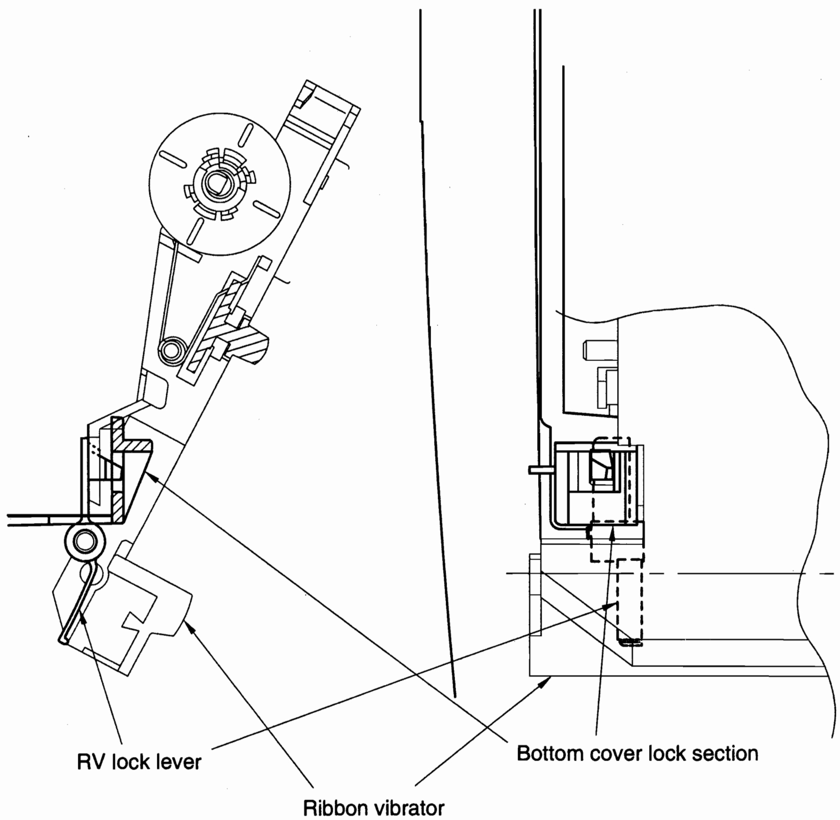


Fig. 1.18-1

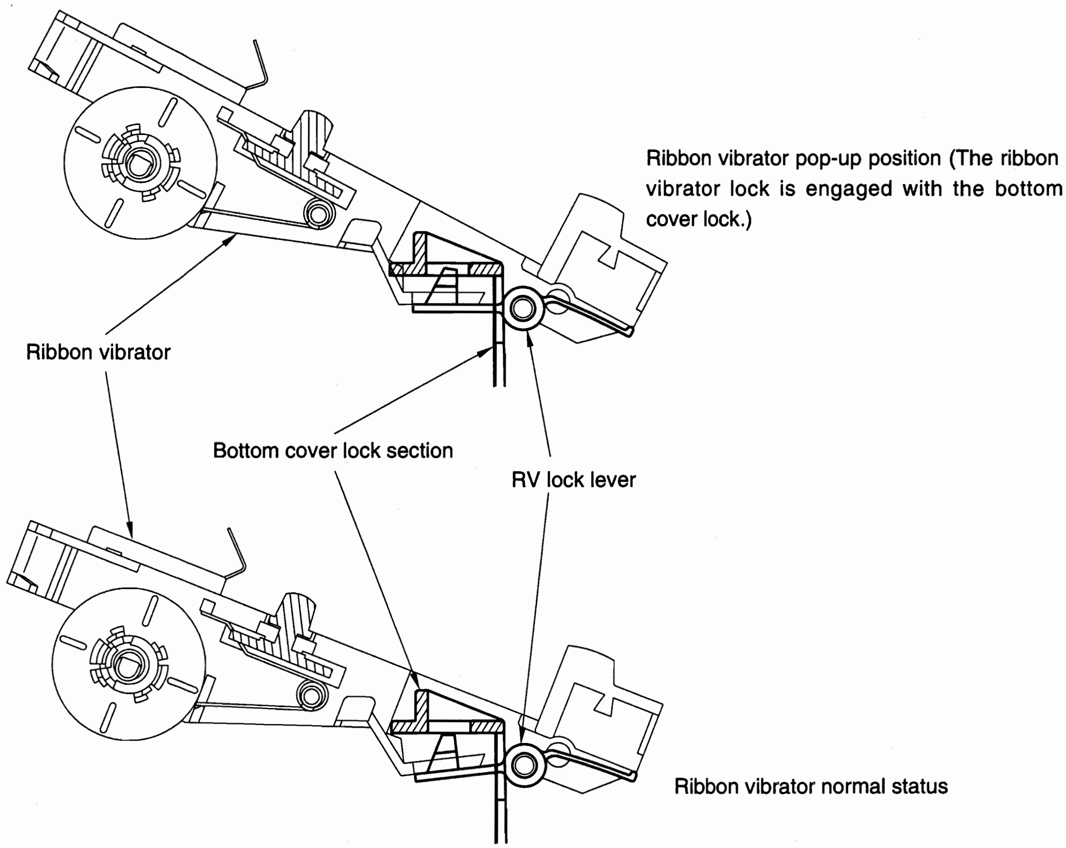

Ribbon vibrator pop-up position (The ribbon vibrator lock is engaged with the bottom cover lock.)
Ribbon vibrator
Bottom cover lock section
RV lock lever
Ribbon vibrator normal status

Fig. 1.18-2

CHAPTER II MAINTENANCE

1. DISASSEMBLY AND REASSEMBLY OF THE COVERS

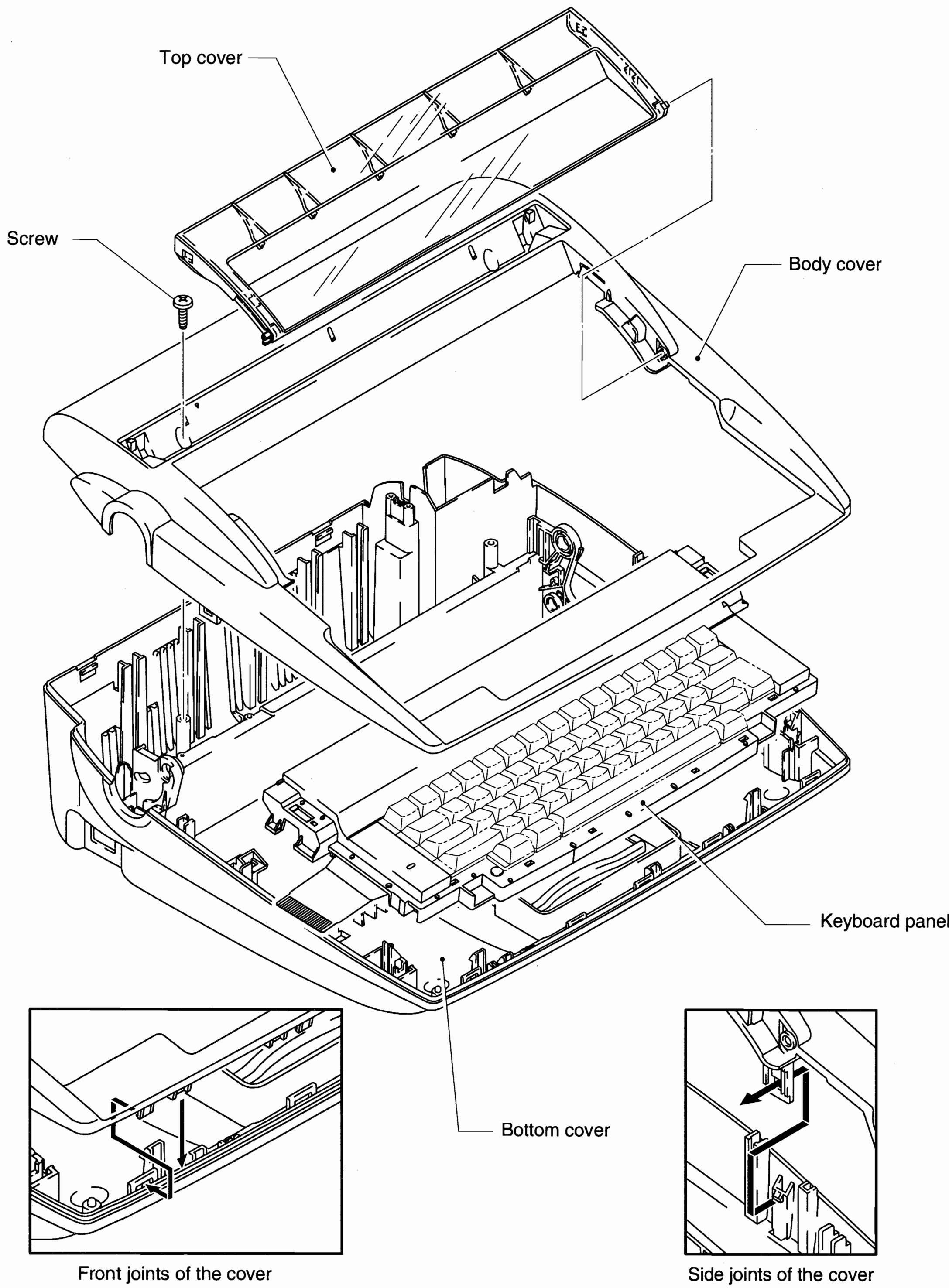


Fig. 2..1

1.1. Disassembly and Reassembly of the Body Cover

(1) Turn off the power switch and unplug the power cord.

(2) Remove the body cover assembly.

a) Remove two body cover mounting screws (behind the platen).

b) Remove the top cover.

c) Move the head holder assembly to the center.

d) Hold down the right end of the keyboard panel and pull up the front right corner of the body cover to disengage the joints of the body and bottom covers.

Also disengage the joints at the front left corner of the body and bottom covers in the same way.

e) To disengage the right side joints of the body cover, hook the joints with fingers while holding the rear right side of the cover, gently releasing the joints. Disengage the left side joints in the same way.

f) Hold the body cover on its both sides and push it toward the rear side to disengage the rear joints of the body and bottom covers.

g) Now the body cover is removed from the bottom cover.

To reassemble, engage the rear joints of the body cover first, and then, engage the front joints. Make sure that all joints are correctly engaged and there is no gap between the body cover and the bottom cover. Install the body cover mounting screws.

1.2. Disassembly of the Top Cover

The top cover is assembled to the body cover by the pins at the right and left ends engaged in the holes in the body cover.

To remove, disengage the pins from the holes in the body cover by bending a little the top cover.

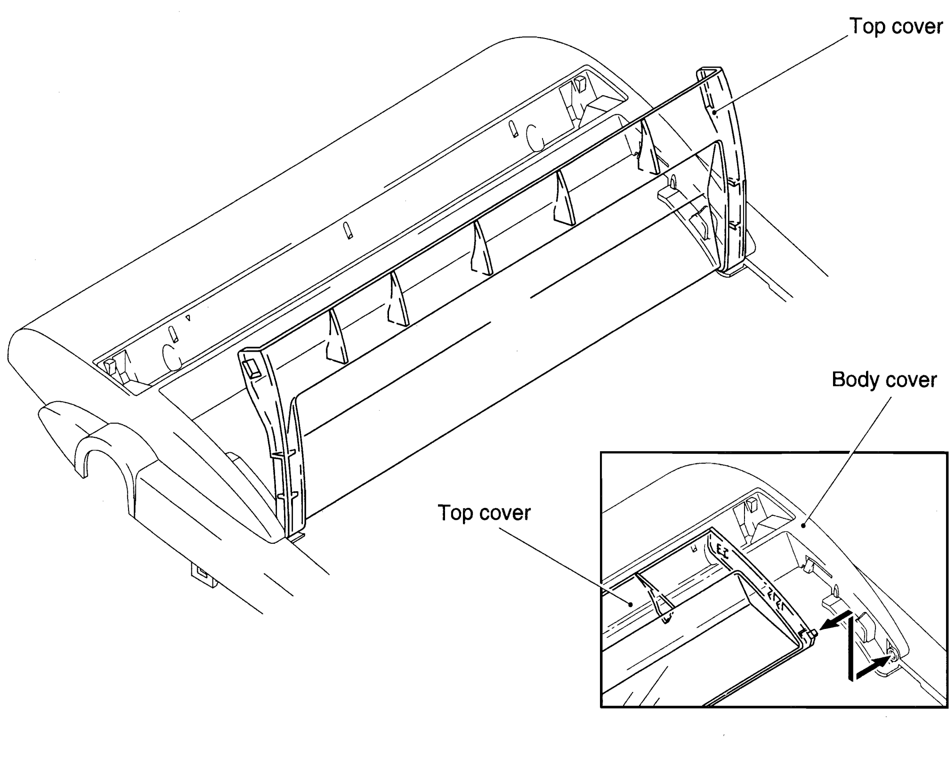


Fig. 2.2

2. DISASSEMBLY AND REASSEMBLY OF THE CIRCUIT BOARDS

2.1. Keyboard Panel

The keyboard panel is secured to the bottom cover by two hooks on the right and left sides and other two hooks on the front side. To remove the keyboard panel, push the hooks outward and disengage the keyboard panel from them.

The keyboard PCB and the base plate are assembled to the keyboard panel. The keyboard PCB cable is connected to the CPU PCB. Remove the cable from the CPU PCB and remove the keyboard PCB.

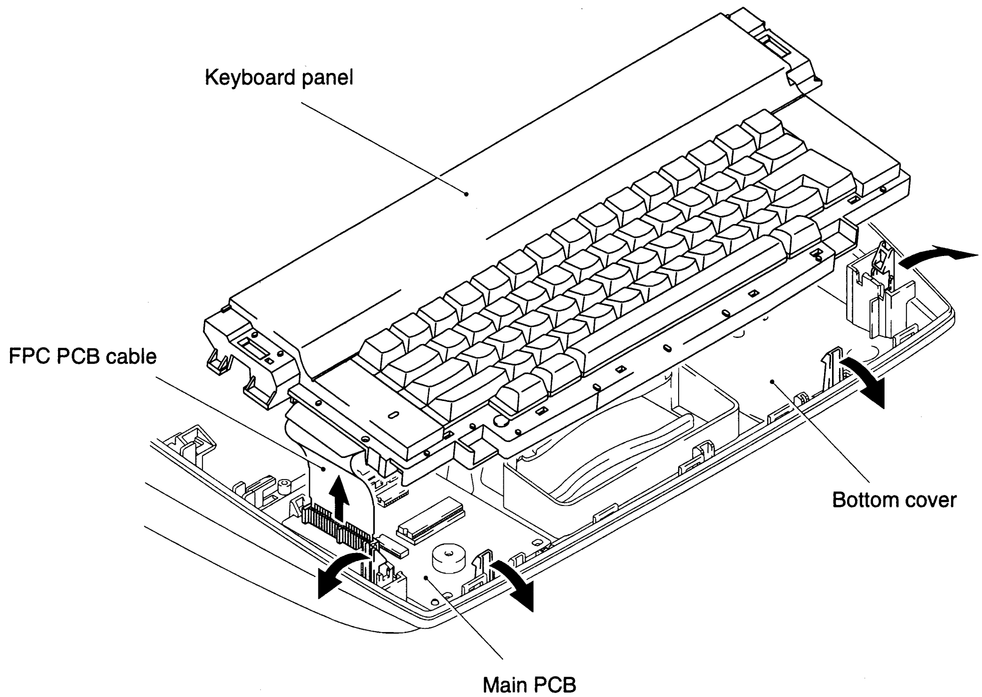


Fig. 2.3

2.2. Keyboard PCB (UK Production Model)

The keyboard PCB (FPC PCB) is a sheet of film and assembled between the keyboard panel and the base plate. The keyboard PCB can be removed by releasing the hooks.

To reassemble, set the keyboard PCB on the keyboard panel by aligning it with the pins, and assemble the base plate by engaging the hooks of the keyboard panel with the slots in the base plate.

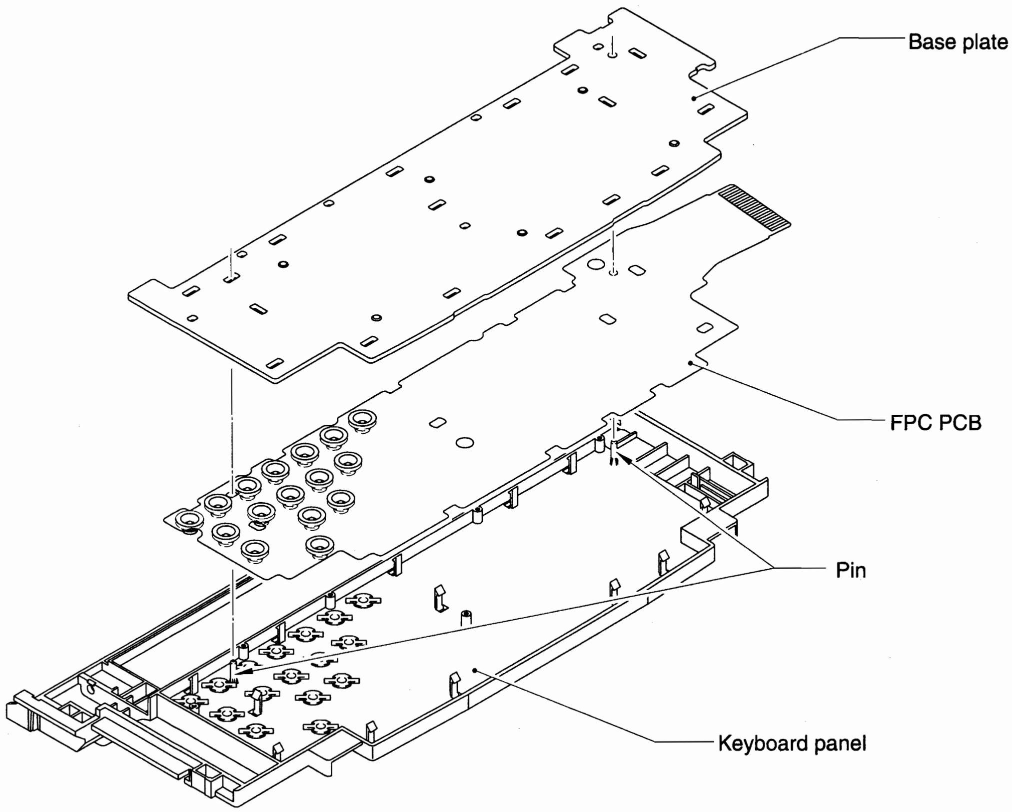


Fig. 2.4-1

2.3. Keyboard PCB (USA Production Model)

The keyboard PCB consists of two films, the FPC board and the rubber spring film, and assembled between the keyboard panel and the base plate. The keyboard PCB can be removed by releasing the hooks.

To reassemble, set the keyboard PCB on the keyboard panel by aligning it with the pins, and assemble the base plate by engaging the hooks of the keyboard panel with the slots in the base plate.

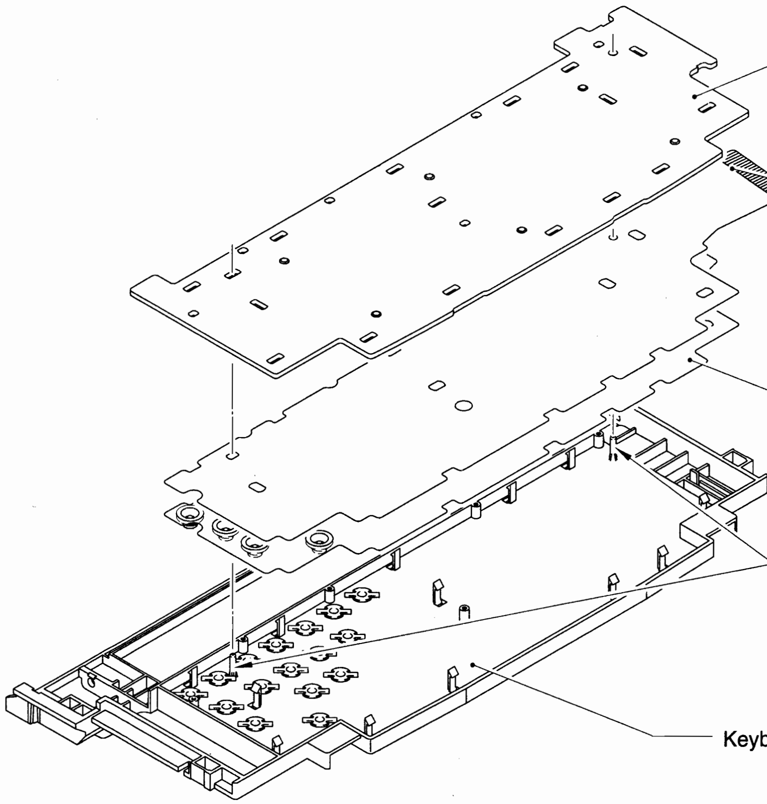


Fig. 2.4-2

2.4. CPU PCB

The CPU PCB is assembled to the bottom cover and retained by hooks. To disassemble, remove all connectors and cables connected to the PCB and disengage the PCB from the hooks of the bottom cover.

Note 1: *Always hold the connector housing when removing the connector. Never pull on the cable.*

Note 2: *Since the lead wires of the keyboard PCB are thin and easily break, use caution not to sharply bend the lead wires.*

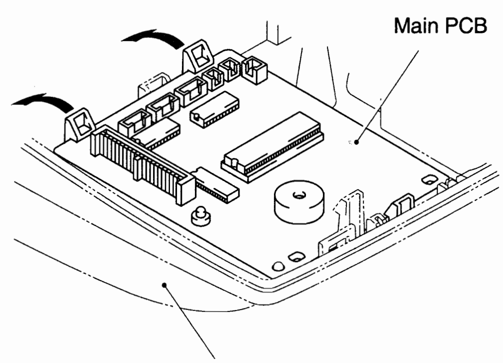


Fig. 2.5

3. DISASSEMBLY AND REASSEMBLY OF THE POWER SUPPLY UNIT

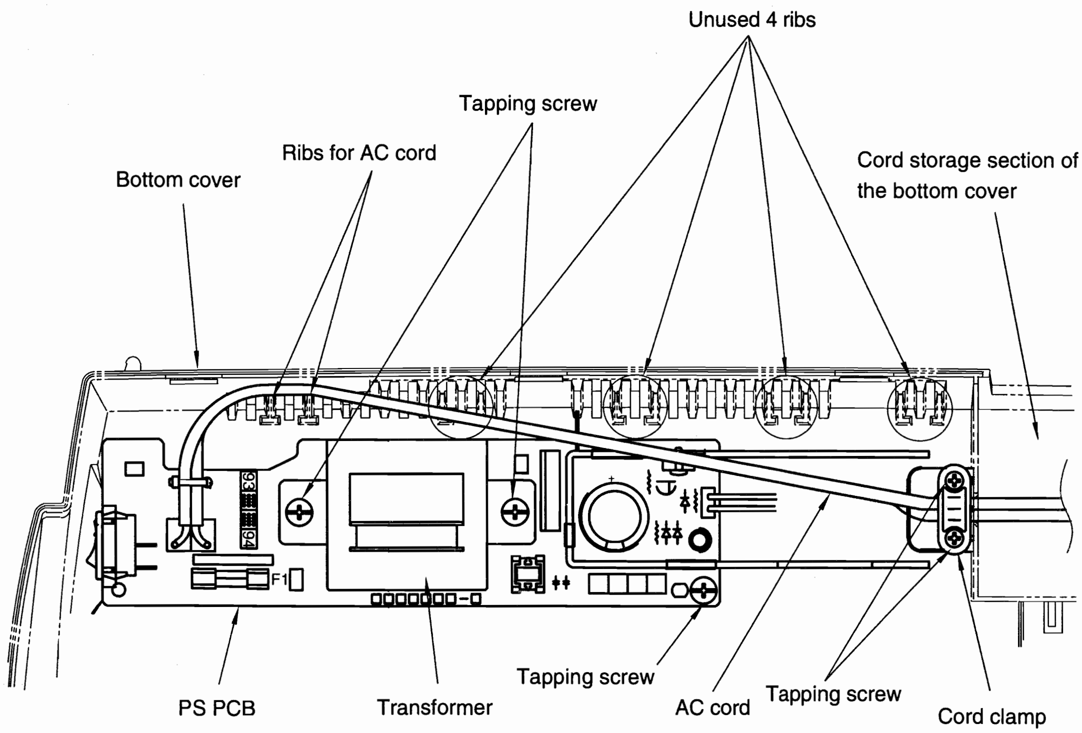


Fig. 2.6

3.1. Power Cord

The power cord, stored in the rear right corner of the body cover, enters the machine body through the hole in the cord storage section of the bottom cover. The cord is then held by a cord clamp and secured to the ribs of the bottom cover, and connected to the power supply PCB.

To remove, remove the cord clamp and release the cord from the ribs of the bottom cover, and then remove the soldered connection on the power supply PCB.

Note 1: *When connecting the cord, follow the N.L indication given at the mounting part of the power supply PCB.*

Note 2: *Since the cord clamp fixing screws are tapping screws, tighten them so that they are driven along the existing threads.*

See 3.3 Wire connection schematic for the N/L identification of the power cord.

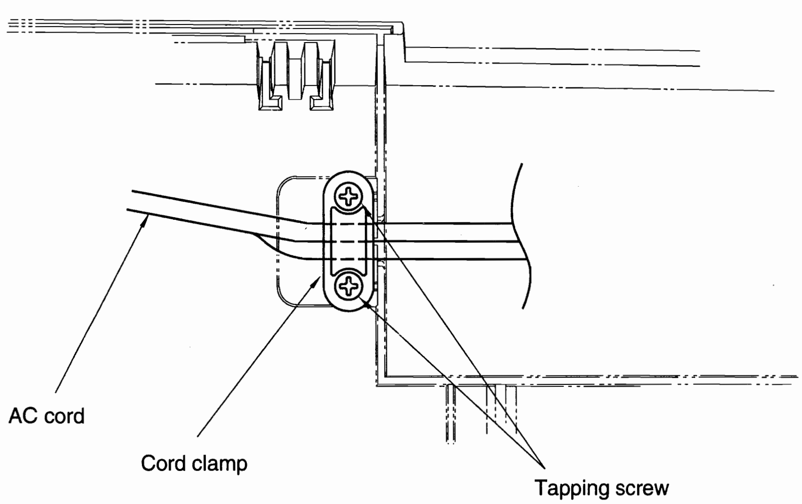


Fig. 2.7

3.2. Power Supply PCB

As shown in Fig. 2.5, the power supply PCB has a transformer and is assembled to the bottom cover. To disassemble the power supply PCB, remove two transformer fixing screws and PCB fixing screw.

Note: *Since the transformer fixing screws are tapping screws, tighten them so that they are driven along the existing threads.*

3.3. Wire Connection Schematic (Primary Side)

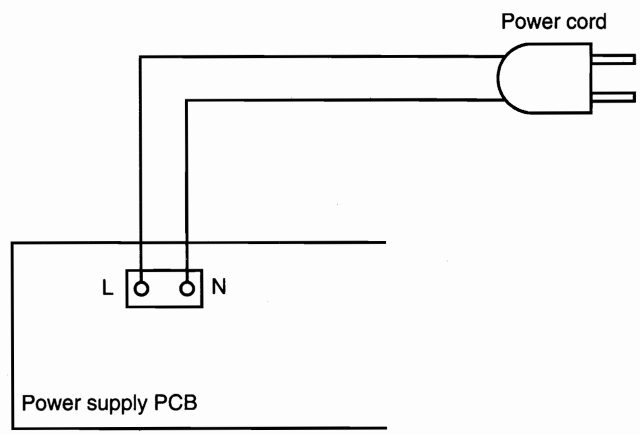


Fig. 2.8

Specification	Power cord	
U.S.A. Canada	L	(L N)
	N	(Sectional view of the cord)
Europe	L	Brown
	N	Blue
	L	
	N	
	L	
	N	
	L	
	N	
Japan	L	Black
	N	White

4. DISASSEMBLY AND REASSEMBLY OF THE SPIRAL TUBE

The head holder assembly supports the daisy wheel motor, CA motor, hammer solenoid, and ribbon motor. The lead wires for these parts are bundled together in a spiral tube.

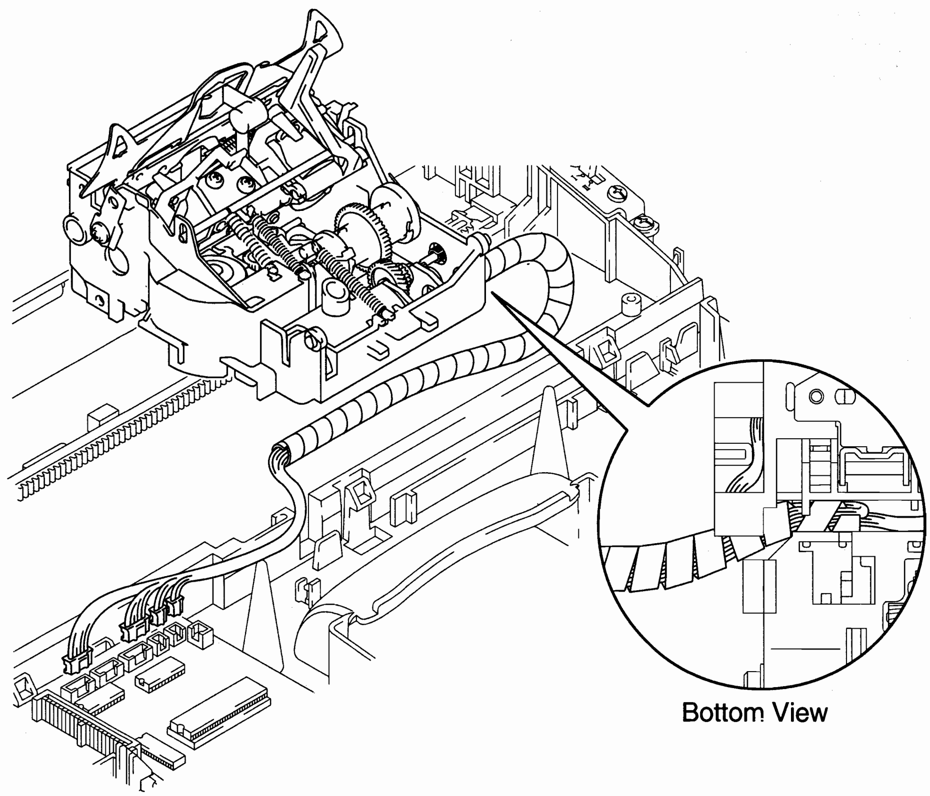


Fig. 2.9

4.1. Disassembly

(1) Remove the head holder assembly from the bottom cover chassis.

(2) Remove connectors from the CPU PCB and remove the spiral tube from the bottom cover.

(3) Remove the spiral tube from the head holder frame guide and remove the spiral tube by turning it counter-clockwise.

4.2. Reassembly

Follow the disassembly procedure in reverse order. After the reassembly, make sure that the daisy wheel harness is not stretched tight when the daisy wheel motor holder is locked. Move the head holder to the right end of the head holder sliding stroke and check the spiral tube position if it does not come into contact with the right side of the bottom cover chassis and with the head holder. And then, secure the spiral tube to the retaining ribs of the bottom cover.

Note: *Always hold the connector housing when removing the connector. Never pull on the cable.*

5. DISASSEMBLY AND REASSEMBLY OF THE CA MOTOR

5.1. Disassembly

Remove the head holder assembly first, and then, remove the CA motor.

The CA motor is mounted to the CA motor holder in the head holder assembly. Remove the CA motor holder from the head holder assembly, and remove fixing screws to remove the CA motor.

5.2. Reassembly

(1) Mesh the CA intermediate gear with the CA motor gear and secure the motor to the CA motor holder.

(2) Adjust the head holder home position after reassembling the CA motor. (See Section 7.)

(3) Reassemble the extension spring between the head holder and the CA motor holder.

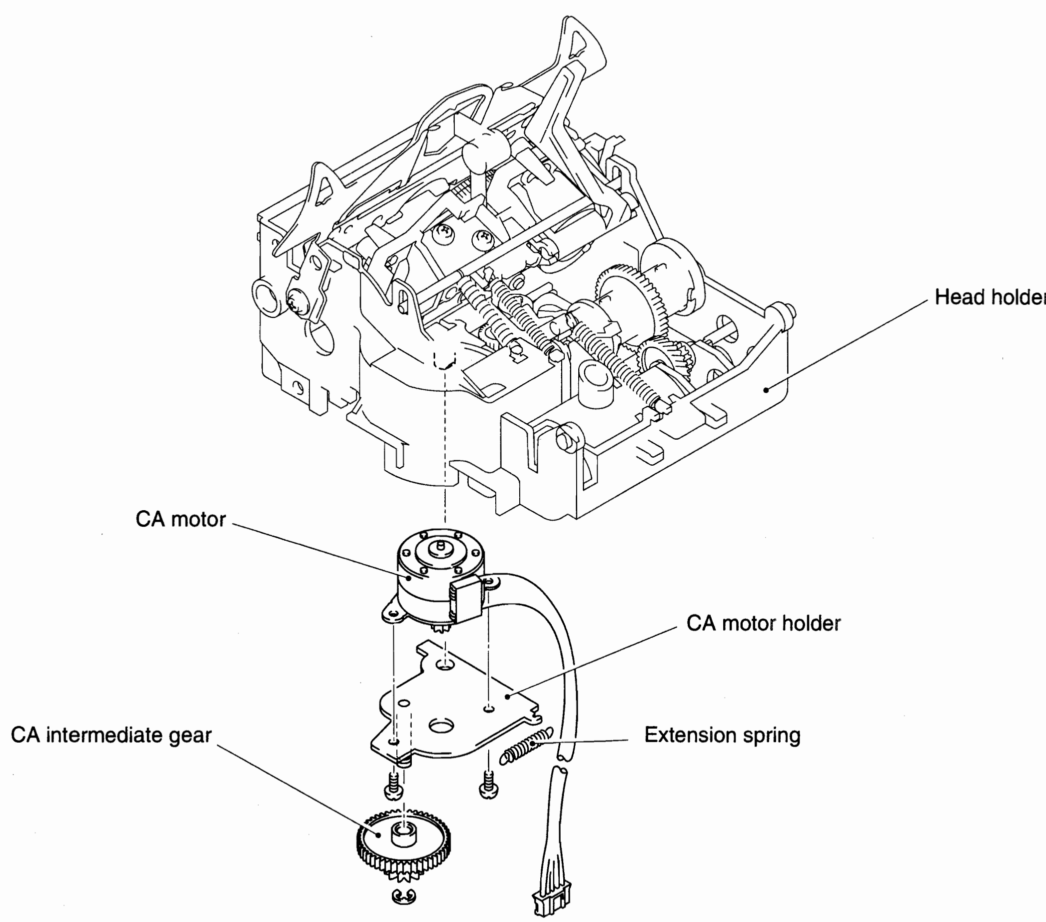


Fig. 2.10

6. DISASSEMBLY AND REASSEMBLY OF THE RACK

6.1. Disassembly

Remove the head holder assembly first, and then, remove the rack.

Remove the screws at the left end of the rack, and slide the rack to the right and disengage the rack from the rack guide, remove the rack from the bottom cover.

6.2. Reassembly

Fit the right end of the rack in the bottom cover, and engage the rack with the rack guide, secure the left end of the rack with screws.

Note: *Adjust the head holder home position after reassembling the rack. (See Section 7.)*

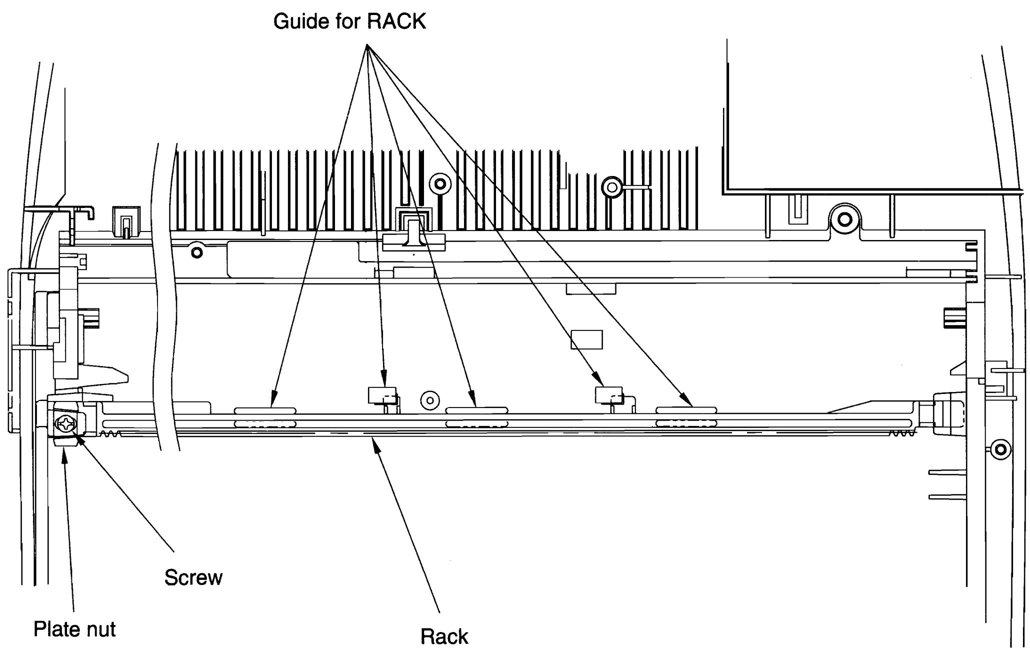


Fig. 2.11

7. DISASSEMBLY AND REASSEMBLY OF THE HEAD HOLDER ASSEMBLY

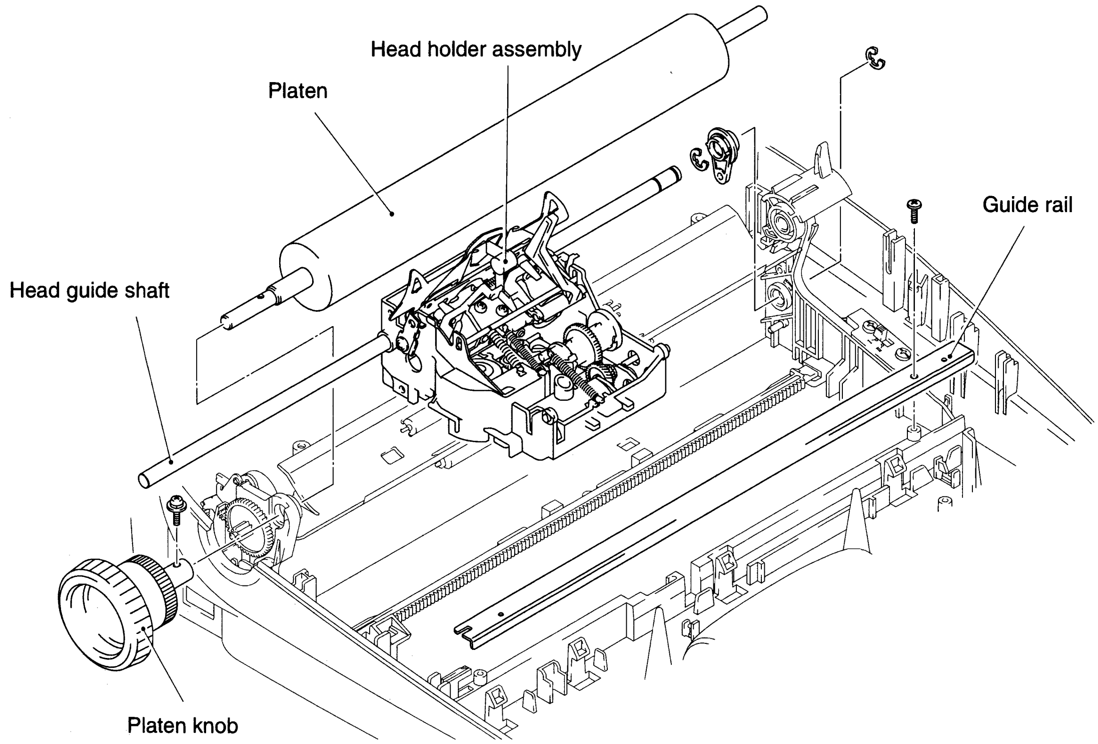


Fig. 2.12

7.1. Disassembly

(1) Remove the platen knobs and the platen. (See 13. DISASSEMBLY AND REASSEMBLY OF THE PAPER FEED MOTOR)

(2) Remove the guide rail fixing screws, and then, remove the guide rail from the bottom cover.

(3) Remove the retaining ring and the head guide shaft from the bottom cover while removing the head holder assembly.

7.2. Reassembly and adjustment:

Follow the disassembly procedure in reverse order. Use a special checker and adjust the mounting position of the rack and the head holder assembly.

7.3. Adjustment of the Rack Position

(1) Connect the power supply PCB and the CA motor to the checker (CH-60A).

(2) Reassemble the rack to the bottom cover lightly tighten the rack fixing screws. (The rack can be moved in the right and left directions.)

(3) Reassemble the head holder assembly to the bottom cover chassis, and move the rack and the head holder assembly to the left end of the stroke. (The ribbon vibrator must be removed.)

(4) Hold the head holder assembly in the left end position, and excite the CA motor in the D-A phase by using the checker. Tighten the rack fixing screws to secure the rack in this condition.

(5) Move the head holder assembly by using the checker to the left. After the head holder assembly hits against the left end of the bottom cover chassis, the head holder kicks back to the right. Make sure the excitation phase of the motor is C-D.

Note: *When a line checker is used, make sure that the head holder kicks back in the motor phase D-A .*

8. DISASSEMBLY AND REASSEMBLY OF THE RIBBON VIBRATOR ASSEMBLY

8.1. Disassembly

(1) Remove the RV backlash diminishing spring installed to the right side of the head holder.

(2) Disengage the left pivot shaft of the head holder from the ribbon vibrator hole by bending the left pivot shaft of the head holder a little to the inside.

(3) Move the ribbon vibrator to the right and remove the ribbon vibrator assembly from the the right pivot shaft of the head holder and the lift cam.

8.2. Reassembly

Follow the disassembly procedure in reverse order.

(1) Reassemble the ribbon vibrator adjust shaft to the ribbon vibrator cam (lift cam) groove and the ribbon vibrator hole to the right pivot shaft of the head holder.

(2) Reassemble the ribbon vibrator hole to the left pivot shaft of the head holder by pressing down the ribbon vibrator.

(3) Reassemble the RV backlash diminishing spring to the head holder.

After the reassembly of the ribbon vibrator adjust shaft, adjust the ribbon striking position.

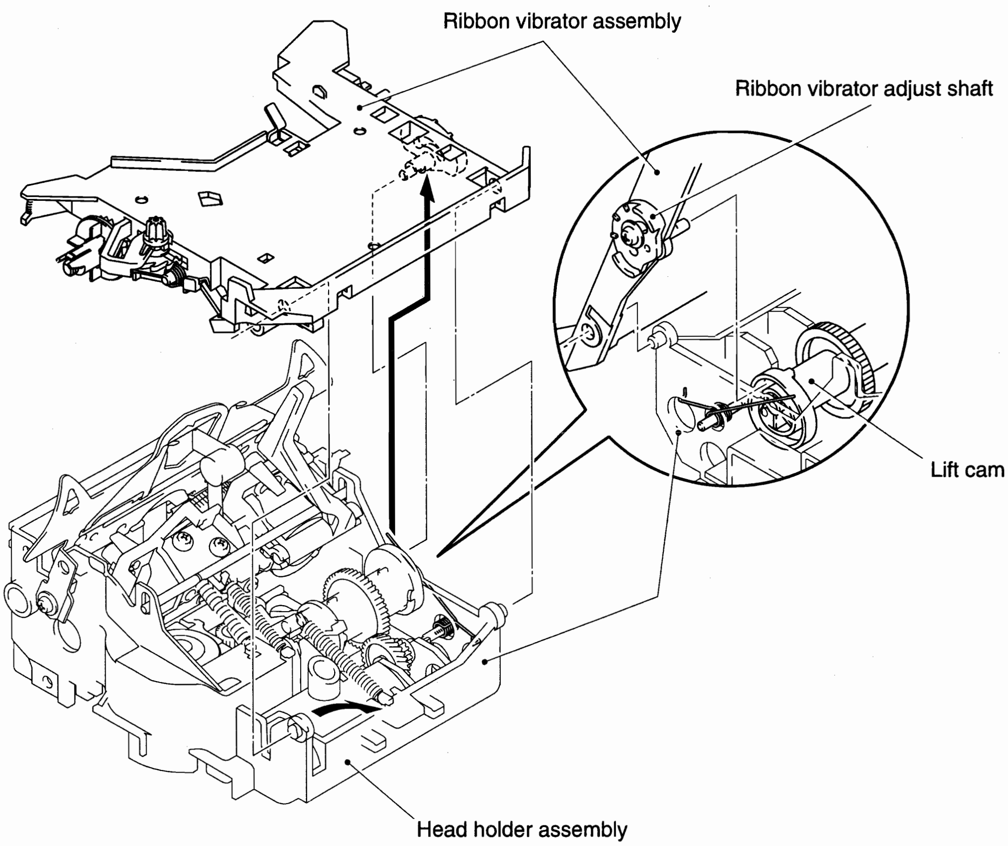


Fig. 2.13

9. DISASSEMBLY AND REASSEMBLY OF THE HAMMER HOLDER ASSEMBLY

9.1. Disassembly

Disassembly the daisy wheel motor holder assembly from the head holder assembly first, and then, remove the hammer holder assembly. (See Section 10.)

(1) Disassembly retaining ring from the daisy wheel motor holder, and remove the daisy wheel gear and the daisy wheel sub gear.

(2) Disassembly the hammer holder fixing screws (two) and remove the hammer holder assembly from the daisy wheel motor holder by shifting it to the front.

(3) Loosen the print hammer center screw and remove the print hammer assembly.

9.2. Reassembly

Follow the disassembly procedure in reverse order. Make sure that the print hammer assembly does not have lateral play and operates with its weight.

Note: *Adjust the daisy wheel motor home position after reassembling the daisy wheel motor and the daisy wheel gear.* page 37.

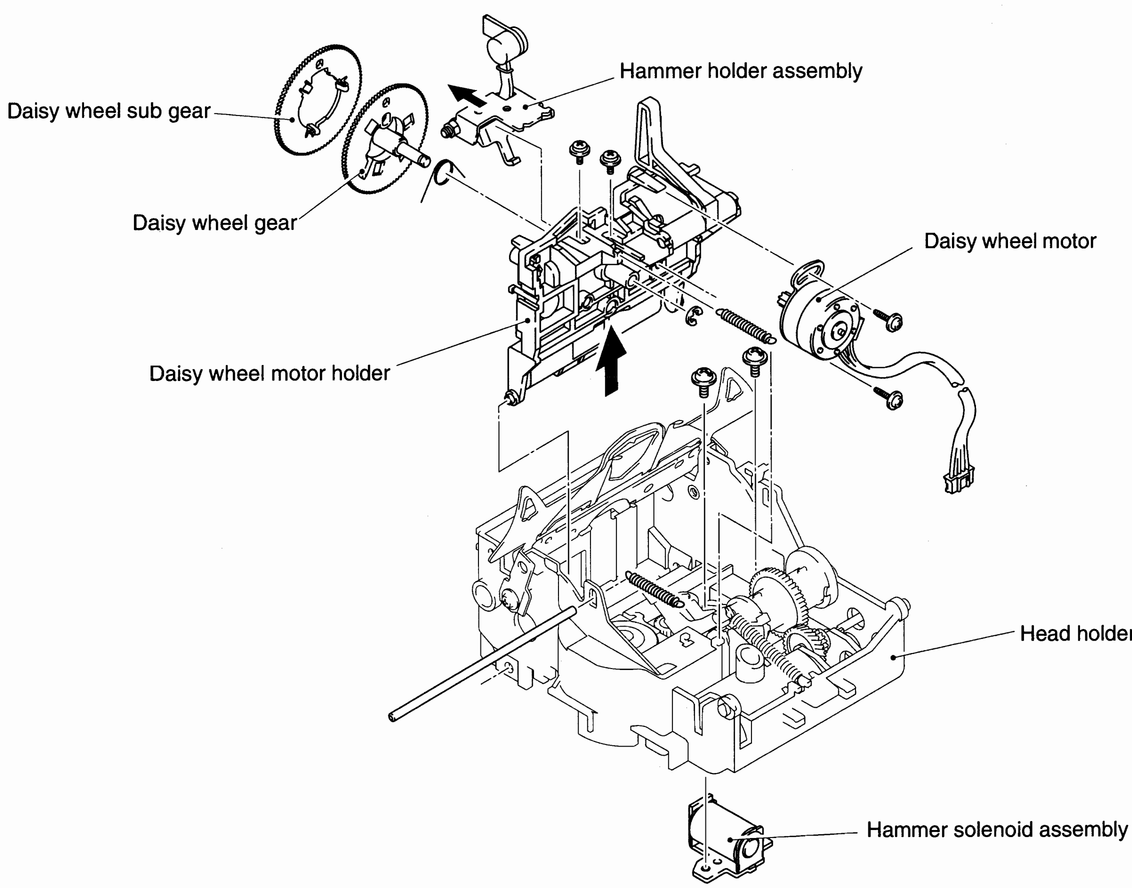


Fig. 2.14

9.3. Adjustment

9.3.1. Adjustment of the Hammer Holder Assembly Position

The hammer holder assembly must be assembled so that the center of the print hammer is aligned with the center of the slot in the daisy wheel gear when the daisy wheel gear is in the home position or the center of the print hammer is aligned with the center of the detent of the spoke, when a daisy wheel cartridge is placed.

If the detent of the spoke and the center of the print hammer do not align, double printing or misprinting may occur. Together with the horizontal position adjustment of the hammer holder assembly, the printing position must also be adjusted.

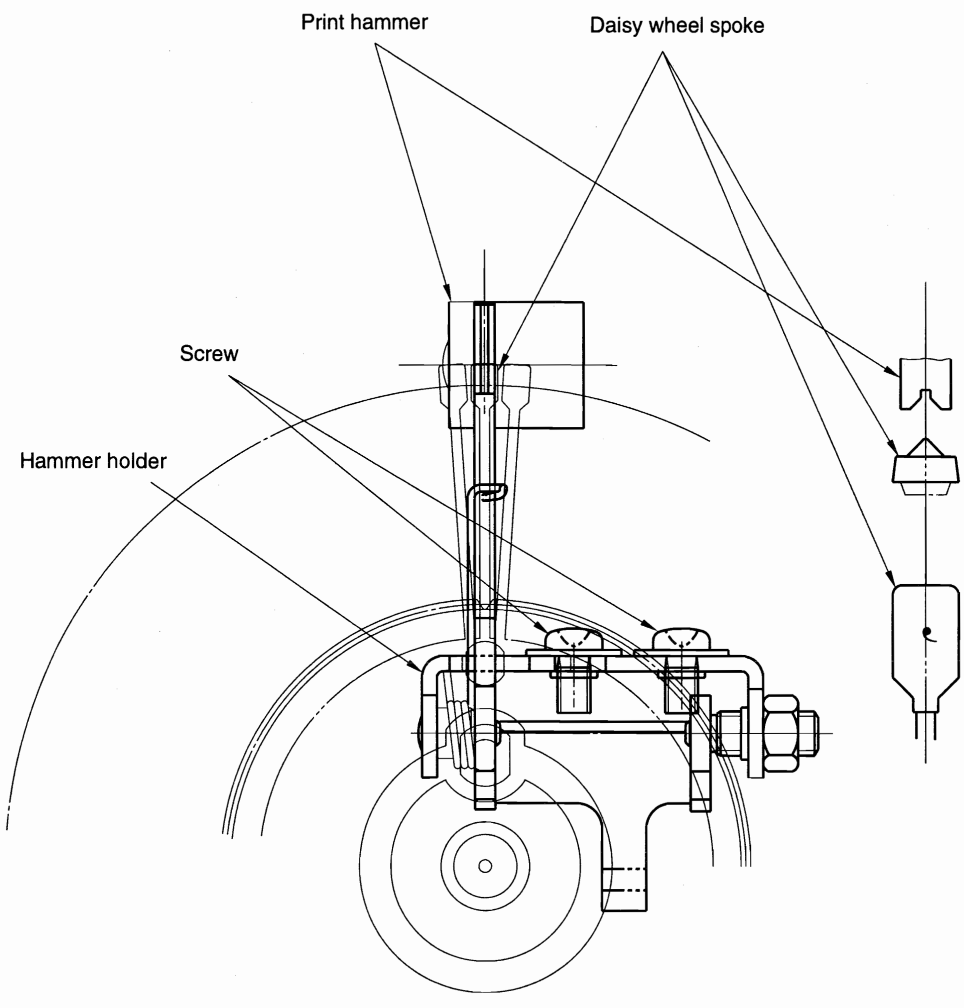


Fig. 2.15

9.3.2. Adjustment of the Printing Position

Make sure that, when the hammer is operated by hand to strike the spoke for "H" against the platen, the type surface must be in full contact with the platen.

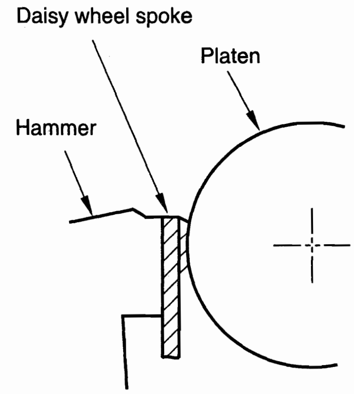
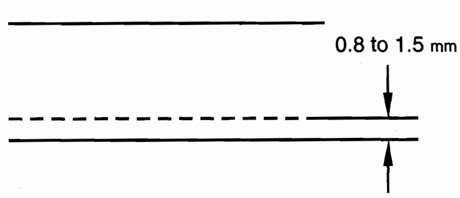


Fig. 2.16

Assemble the ribbon vibrator and a fabric ribbon cassette, and print "H" repeatedly to check for radial alignment and verticality. To check the radial alignment, make sure that there is no difference in print quality between top and bottom.

If there is a difference, loosen two hammer support fixing screws and adjust by moving the hammer holder assembly forward or backward. If the printing is light at the bottom, move the hammer holder assembly toward the platen. If the printing is light at the top, move the assembly toward the keyboard.



Check the printing position of the underline. Make sure that the underlines are printed at 0.8 to 1.5 mm above the lower edge of the ribbon. Use a carbon ribbon for this check.

<Adjustment>

Loosen the ribbon vibrator adjust screws and rotate the ribbon vibrator adjust shaft.

(See Fig. 2.17)

After adjusting the carbon ribbon printing position, be sure to check the correction tape printing position.

After adjusting the printing positions, check or adjust the daisy wheel overrun at hammering. Follow the procedure below.

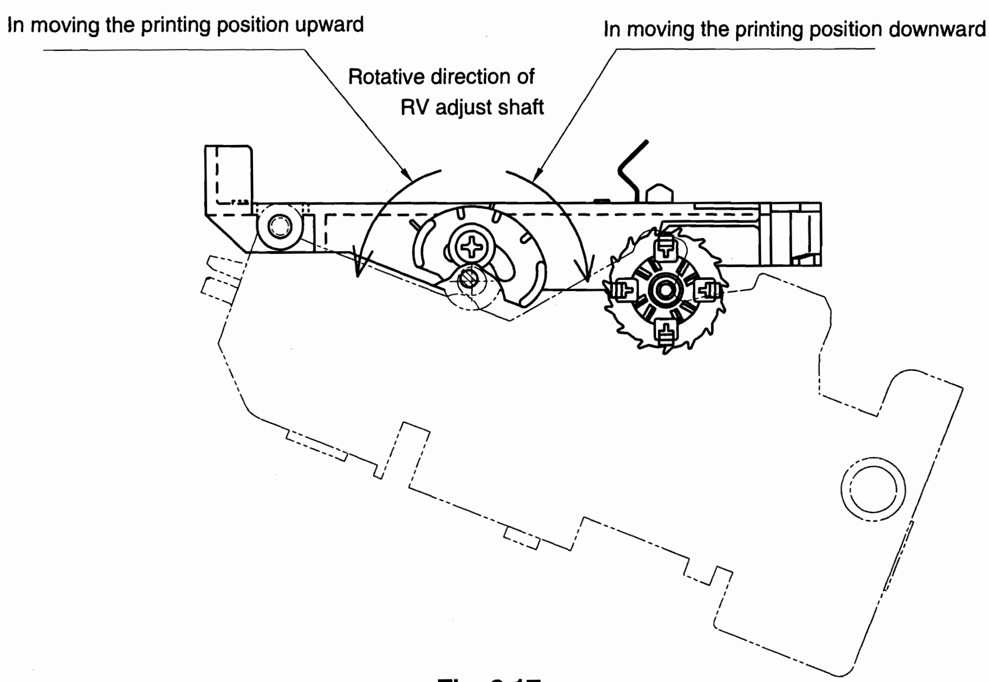


Fig. 2.17

9.3.3. Adjustment of Daisy Wheel Overrun (At Hammering)

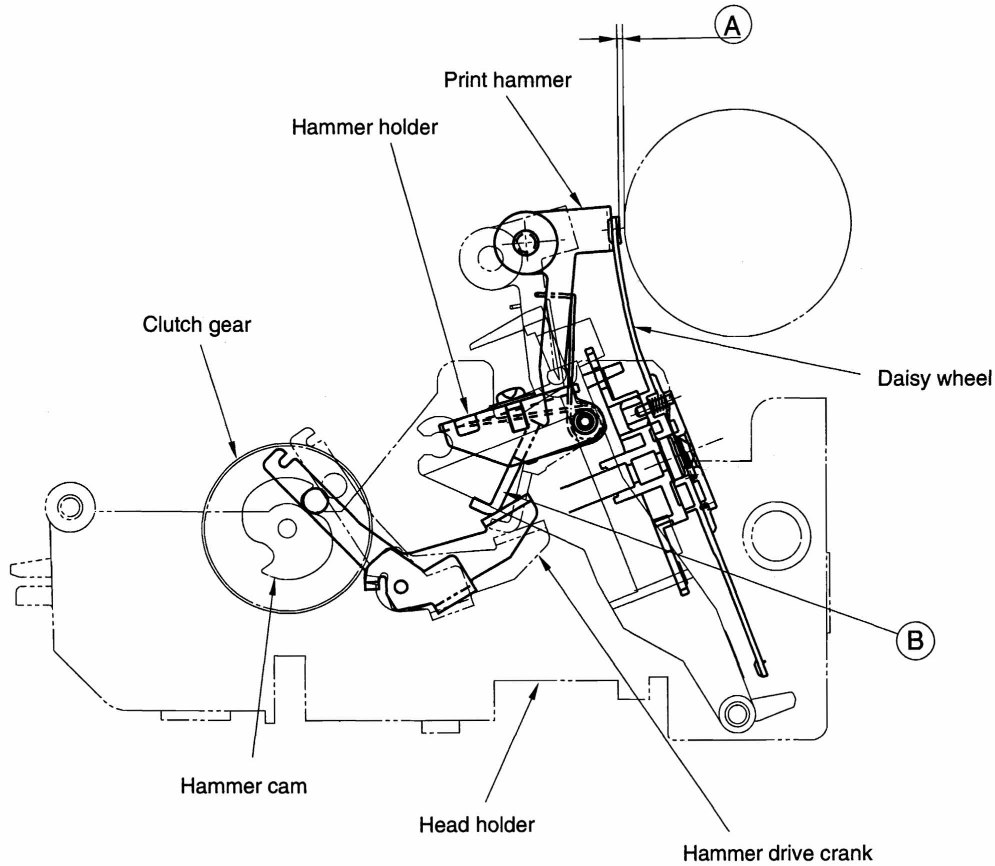


Fig. 2.18

Adjust the daisy wheel overrun as given below.

Release the stopper (hammer side) from the hammer clutch collar. Rotate the clutch gear counter-clockwise by hand so that the hammer cam also rotates. When the hammer drive crank pin drops off the lobe of the hammer cam, the hammer operates to strike the selected spoke against the platen. Adjust the daisy wheel overrun (A) to 0.4 to 0.8 mm by bending part (B) of the print hammer.

10. DISASSEMBLY AND REASSEMBLY OF THE DAISY WHEEL MOTOR HOLDER ASSEMBLY

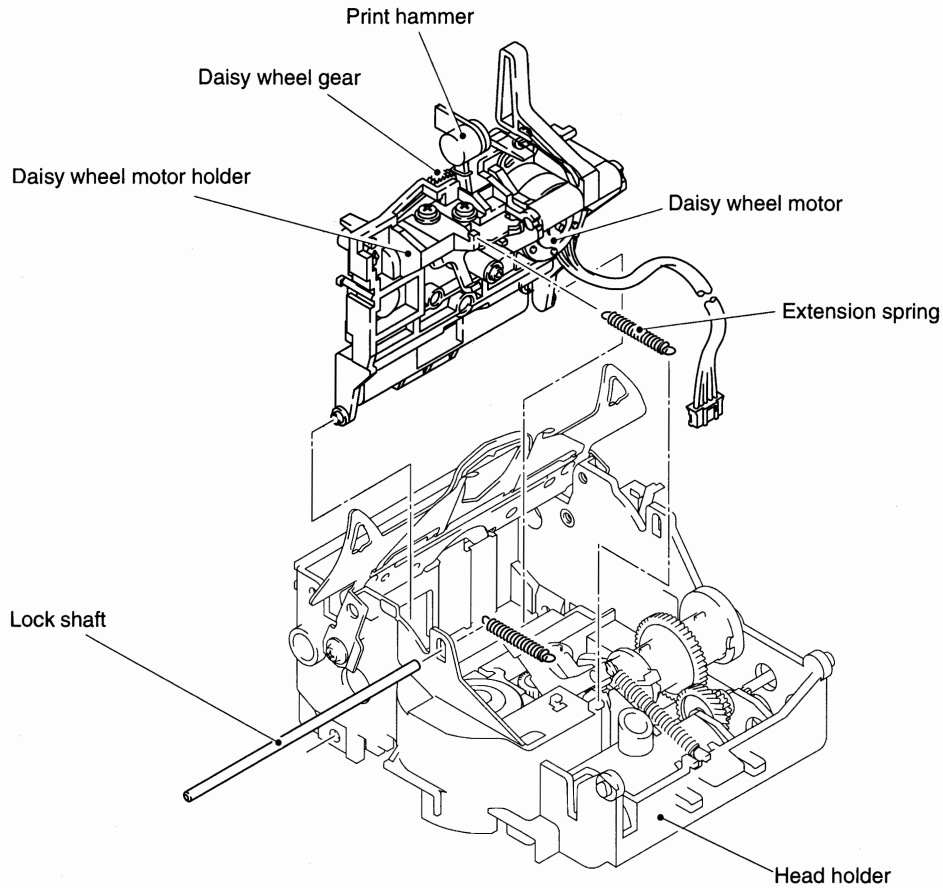


Fig. 2.19

10.1. Disassembly

Disassembly the head holder assembly from the bottom cover chassis first, and then, remove the daisy wheel motor holder assembly.

(1) Disassembly all connectors from the CPU PCB and remove the spiral tube.

(2) Disassembly the ribbon vibrator.

(3) Disassembly the extension spring from the head holder.

(4) Disassembly the lock shaft from the head holder.

(5) Disassembly the daisy wheel motor holder rotating shaft (at both ends) from the head holder by bending the rotating shaft (at both ends) a little to the inside.

Raise the daisy wheel motor holder to remove the daisy wheel motor together with the hammer mechanism and the daisy wheel gear.

Note: *Before disengaging the daisy wheel motor and the daisy wheel gear, mark the meshing point of the daisy wheel motor gear and the daisy wheel gear. This marking will allow correct positioning when those parts are assembled since the home position of the daisy wheel gear must coincide with the home position of the daisy wheel motor gear. When replacing the daisy wheel motor or the daisy wheel gear, adjust the daisy wheel motor home position by using a special checker as described below.*

10.2. Reassembly

Follow the disassembly procedure in reverse order.

10.3. Adjustment of the Daisy Wheel Motor Home Position

(1) Remove the retaining ring, and remove the daisy wheel gear from the daisy wheel motor holder.

(2) Install the daisy wheel motor to the daisy wheel motor holder, and lightly tighten the screws.

(3) Connect the power supply PCB and the daisy wheel motor to the checker, and excite the daisy wheel motor at the home position in phase C-D.

(4) Fit the daisy wheel gear with the daisy wheel sub gear (to make an assembly). Then, fit the daisy wheel gear and daisy wheel sub gear to the daisy wheel motor holder with the center of the slot aligned with the gear top center, and then engage the daisy wheel gear with the daisy wheel motor gear in the home position.

(5) Insert a daisy wheel cartridge. Loosen lightly tightened screws on the daisy wheel motor, and rotate the motor until the center of the hammer is aligned with the detent of the spoke for comma ",". Tighten the screws to secure the daisy wheel motor. Make sure that the daisy wheel gear rotates smoothly.

Note: *Before starting the daisy wheel motor home position adjustment, make sure that the print hammer (hammer holder assembly) and the daisy wheel motor holder are correctly fitted.*

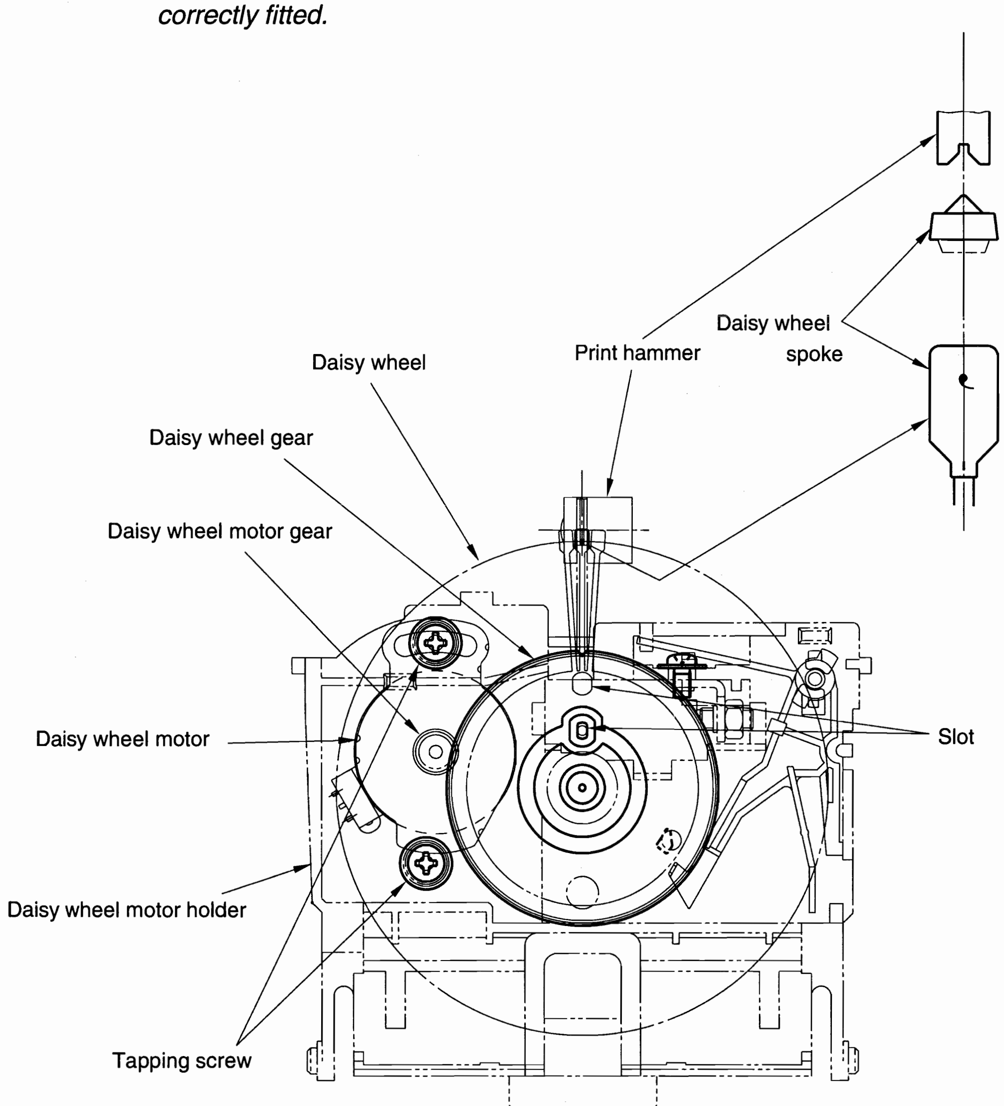


Fig. 2.20

11. DISASSEMBLY AND REASSEMBLY OF THE PAPER METER

The ribbon guide is crimped on the paper meter which is installed to the head holder. The paper meter can be removed by removing the paper meter fixing screws.

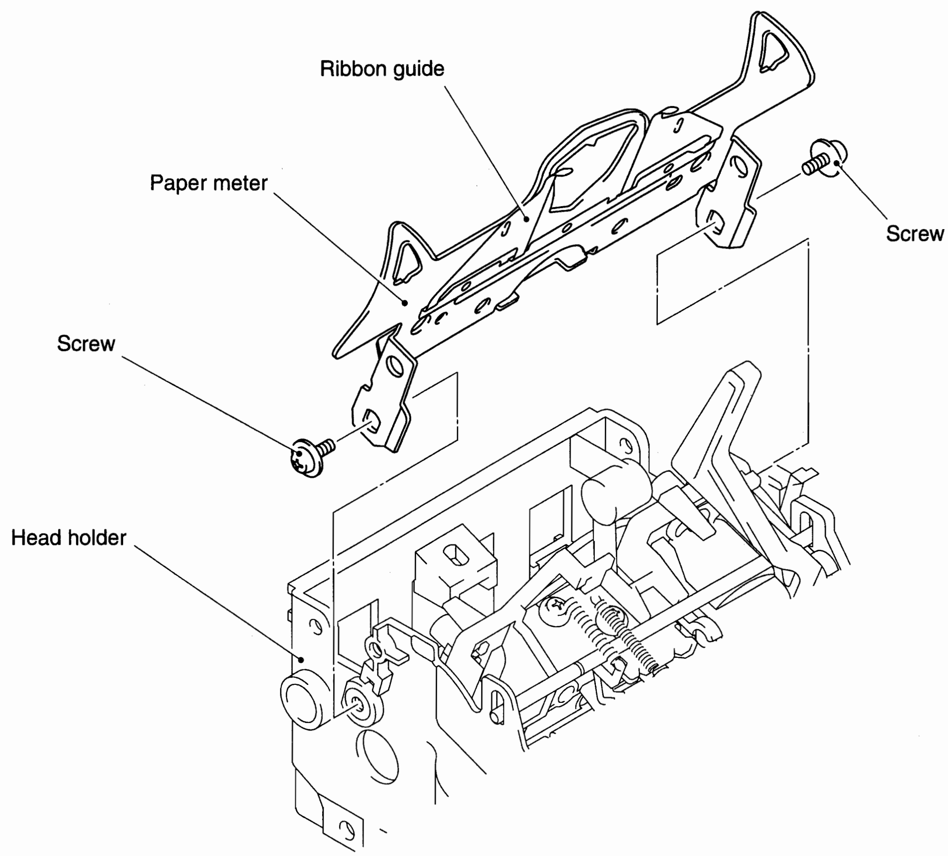


Fig. 2.21

11.1. Adjustment of the Paper Meter Position

Adjust clearance (A) between the ribbon guide and the daisy wheel to 0.8 mm or more, clearance (B) between the ribbon guide and the paper meter to 1.0 mm or more, and clearance (C) between the paper meter and the platen to 0.1 to 0.4 mm. Adjust clearance (C) by loosening the paper meter fixing screws and then moving the guide. Adjust clearances (A) and (B) by bending the ribbon guide.

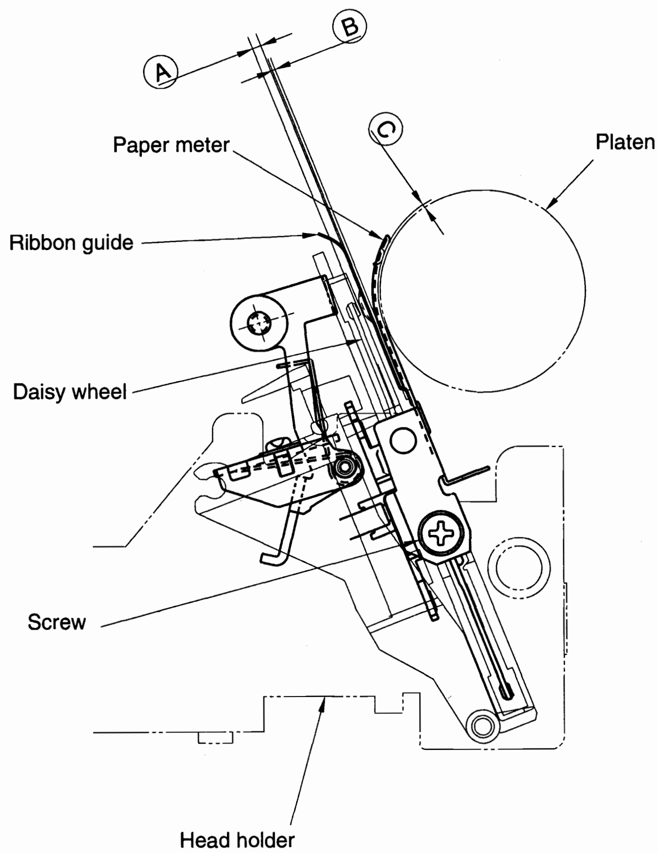


Fig. 2.22

To check the vertical position of the paper meter, print "I" repeatedly and make sure that the upper horizontal edge of the paper guide, in reference to the printed character, is within the tolerance. To adjust the paper meter position, loosen the paper meter fixing screws and move the paper meter.

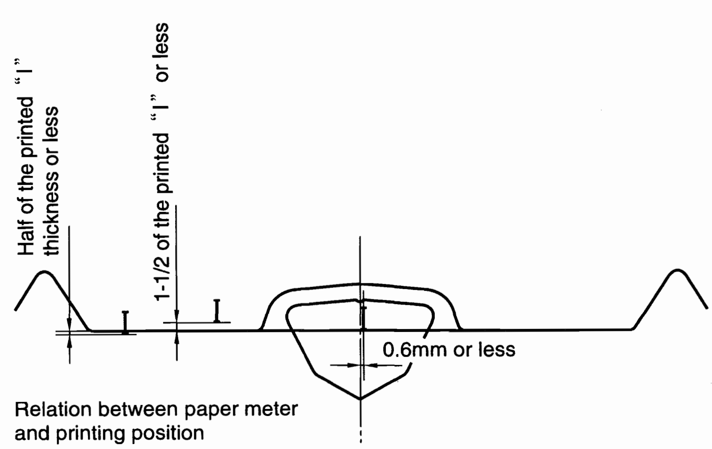


Fig. 2.23

12. DISASSEMBLY AND REASSEMBLY OF THE CLUTCH ASSEMBLY

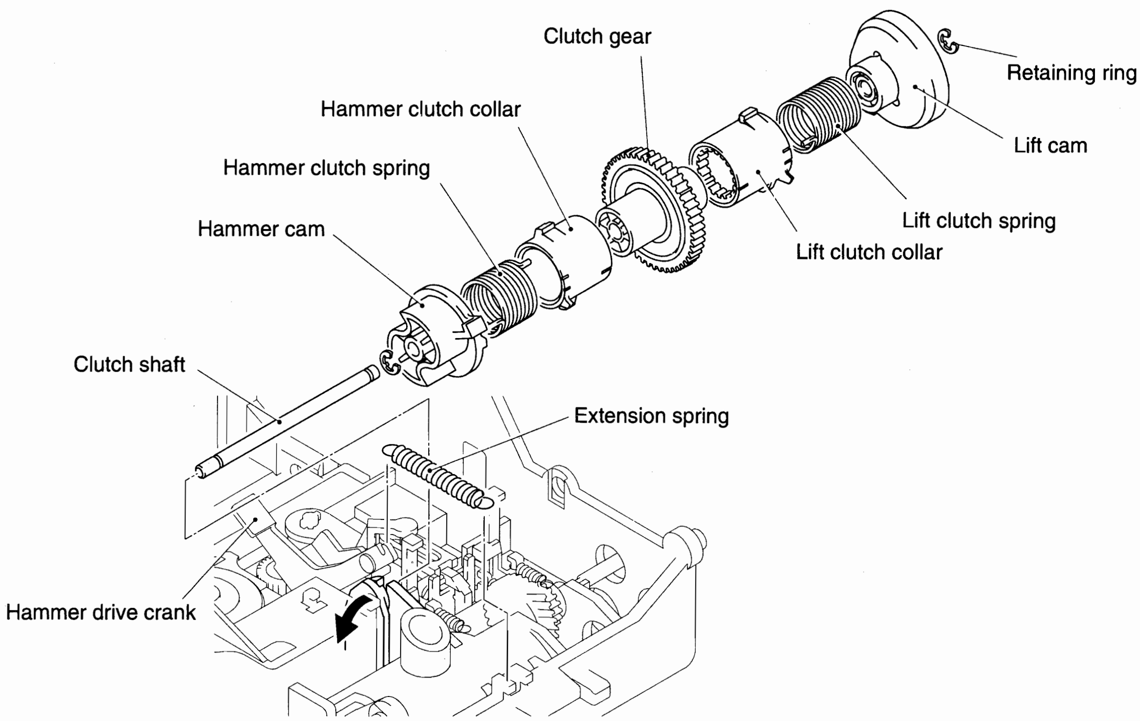


Fig. 2.24

12.1. Disassembly and Reassembly

(1) Disassembly the ribbon vibrator assembly.

(2) Unhook the extension spring from the hammer drive crank.

(3) Lift the left end shaft of the clutch assembly while bending the head holder bearing, and remove the clutch assembly from the head holder.

To reassemble, follow the disassembly procedure in reverse order.

The clutch assembly consists of a lift cam, lift clutch collar, lift clutch spring, clutch gear, hammer cam, hammer clutch collar, hammer clutch spring, clutch shaft, and retaining ring. To disassemble the clutch assembly, remove the retaining ring from the clutch shaft.

When reassembling these components, correct positioning will be necessary. (See Fig. 2.25)

To reassemble, follow the disassembly procedure in reverse order.

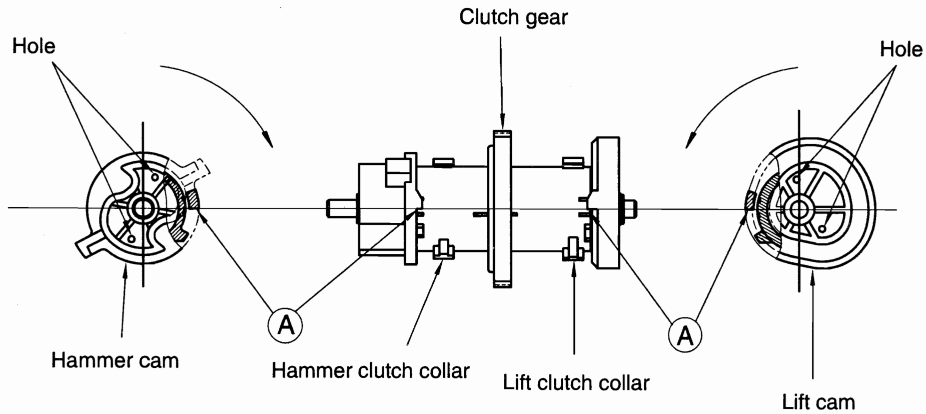


Fig. 2.25

12.2. Adjustment

12.2..1. Adjustment of the Lift Clutch

Fit the correction clutch spring by selecting an appropriate groove inside the correction clutch collar and an appropriate hole in the correction cam so that part (A) of the correction cam comes between the two positioning marks on the correction clutch collar when the clutch gear is rotated in the arrow direction with the correction clutch collar held still.

12..2.2. Adjustment of the Hammer Clutch

Fit the hammer clutch spring by selecting an appropriate groove inside the hammer clutch collar and an appropriate hole in the hammer cam so that part (A) of the hammer cam comes between the two positioning marks on the hammer clutch collar when the clutch gear is rotated in the arrow direction with the hammer clutch collar held still.

12.2.3. Adjustment of the Hammer Solenoid Position

When the armature is pushed against the hammer solenoid, hooks of the stopper and the clutch collar will be released. Adjust the solenoid assembly position so that clearance (B) on the hammer clutch side is 0.5 mm or more and that on the lift clutch side is 0.5 mm or more and the overlap (C) between the stopper (hammer side) and the hammer crank is 1/3 or more of the width (D) hammer drive crank.

Make sure that clearance (E) is 0.2 to 0.5 mm and clearance (F) is 0.4 to 0.7 mm.

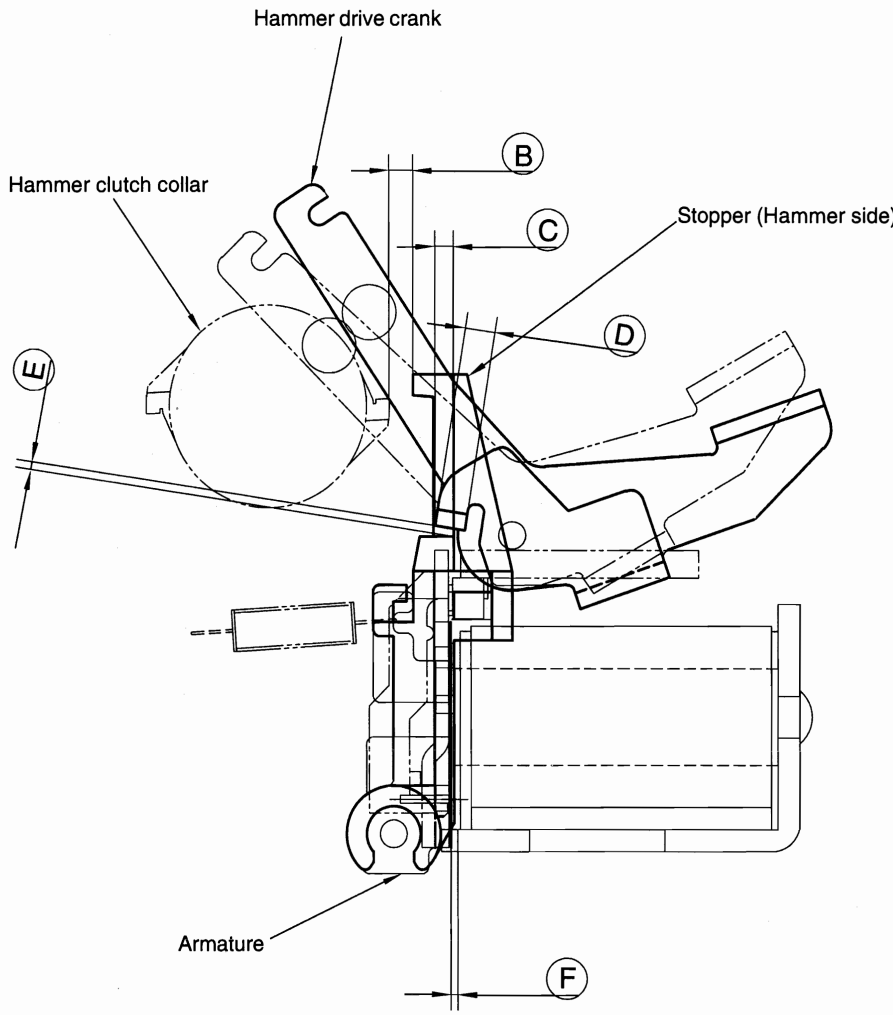


Fig. 2.26

13. DISASSEMBLY AND REASSEMBLY OF THE PAPER FEED MOTOR

13.1. Disassembly and Reassembly

(1) Remove the platen knob fixing screw and slide the platen to the right. Then, bend the pawls of the platen knob and remove the platen knob.

(2) Bend the pawls of the paper feed idle gear and remove the paper feed idle gear from the LF gear holder.

(3) Remove the extension spring on the paper feed motor.

(4) Remove the paper feed motor with LF gear holder from the bottom cover.

(5) Remove the paper feed motor fixing screw.

To reassemble, follow the removal procedure in reverse order.

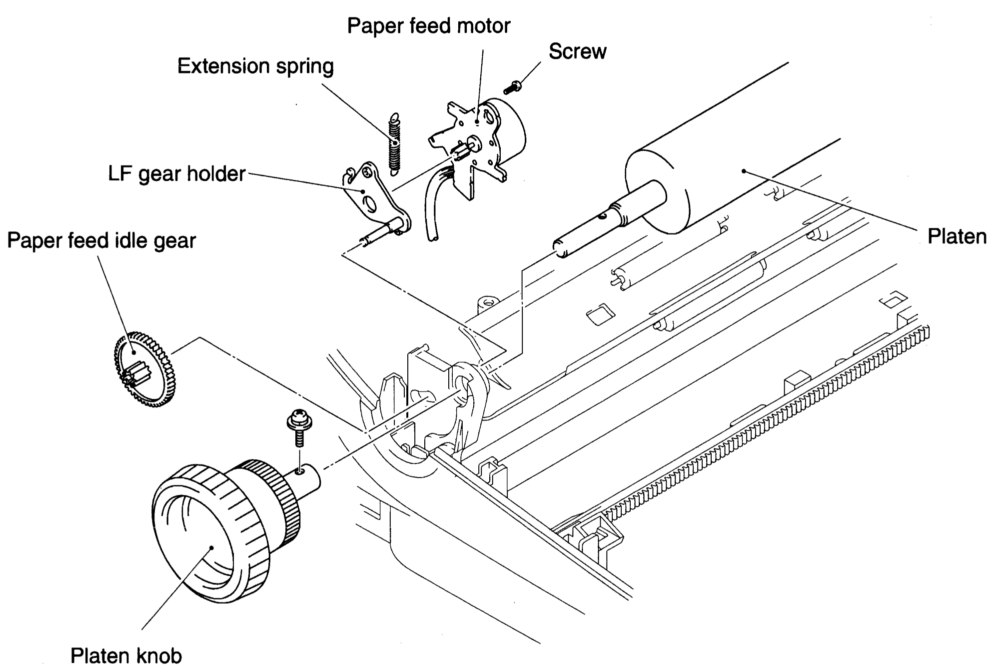


Fig. 2.27

CHAPTER III LUBRICATION

1. LUBRICANTS

Symbol	Lubricant	(Mobil Grease No.1)		(Liqui-Moly booster)
B	Grease B	9	:	1
E	Epinoc grease #1			
S	Silicon grease KS64F			
SO	Silicon oil KF96			

2. PRECAUTIONS

(1) Lubricate carefully so that the oil or grease will not stick to places other than the specified points, otherwise the plastic parts and electronic boards will be adversely effected.

Do not apply an excessive amount of lubricant, otherwise the lubricant may drip onto places other than the specified lubrication points during use or storage.

(2) Make sure to apply a sufficient amount of lubricant to contact parts and sliding surfaces consisting of more than one material

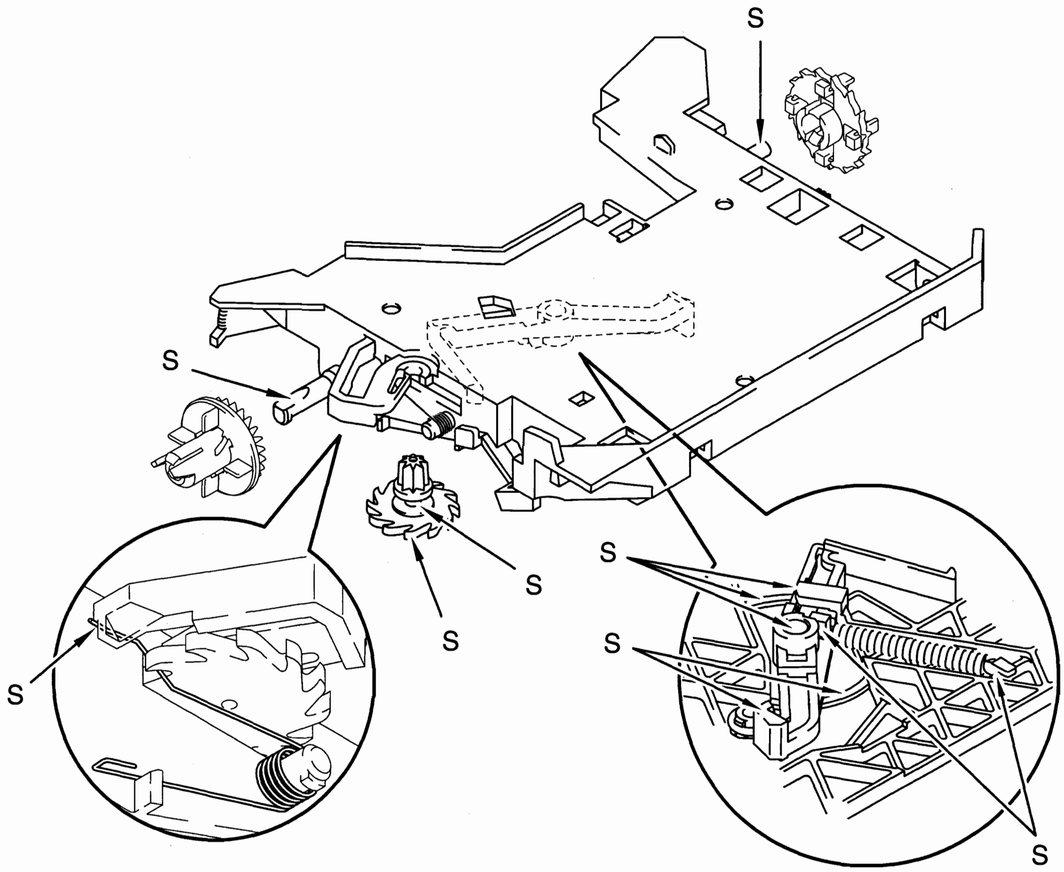


Fig. 3.1 Ribbon feed mechanism

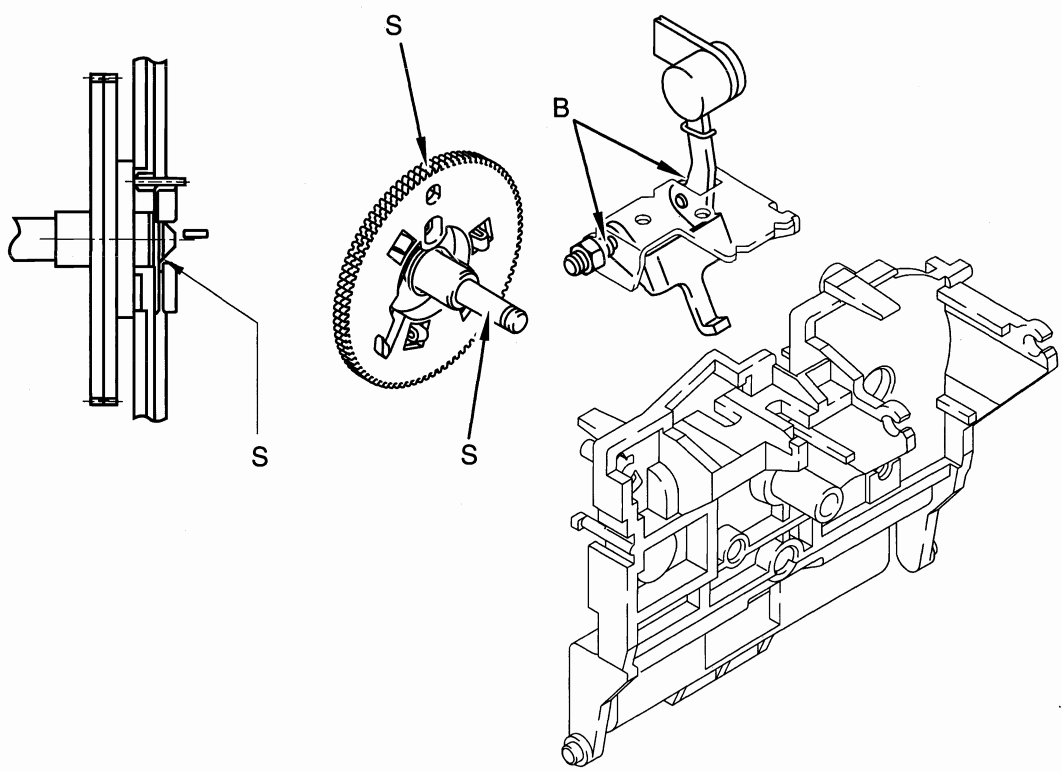


Fig. 3.2 Daisy wheel gear and hammer holder assembly

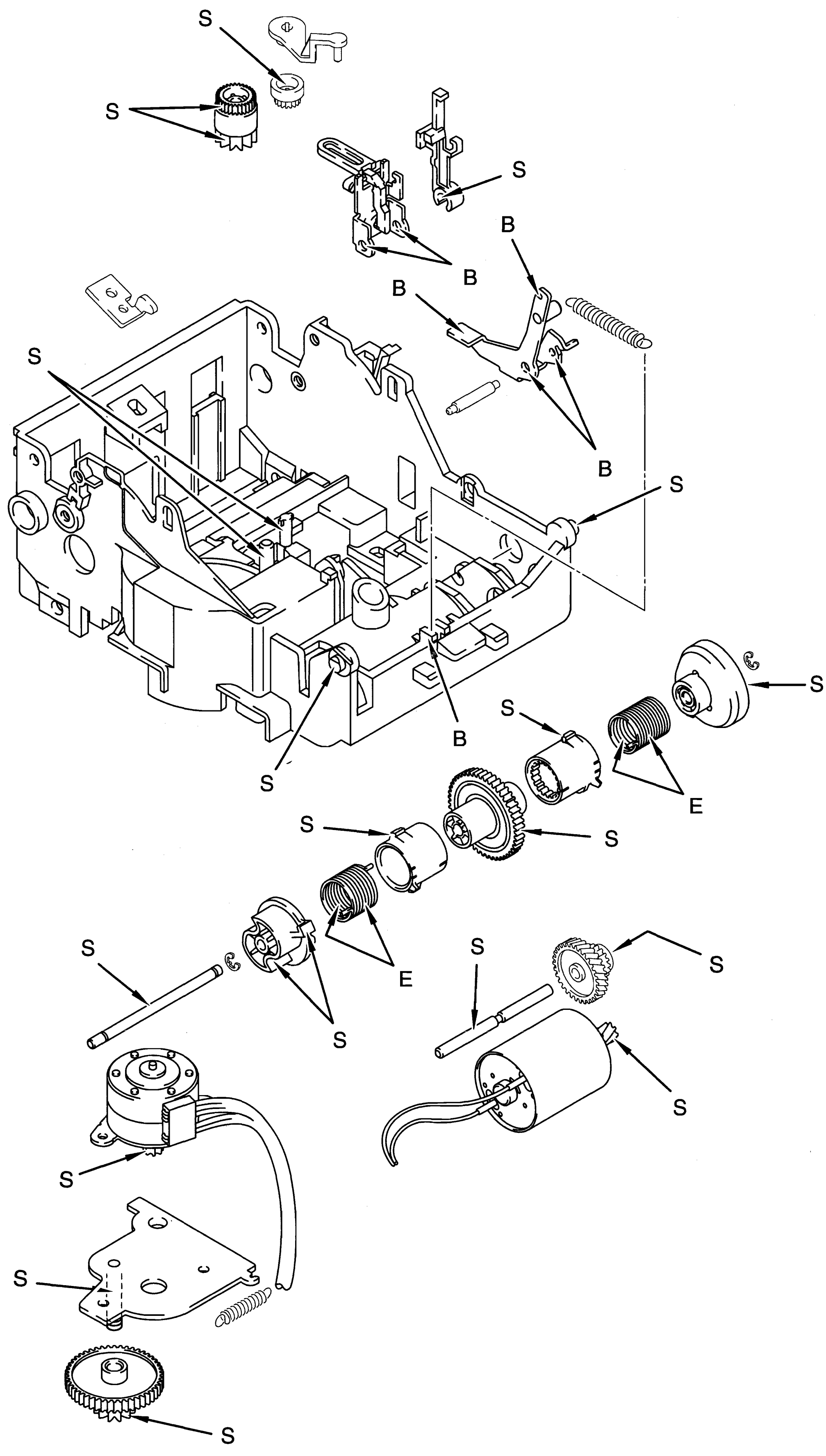


Fig. 3.3 Carrier mechanism

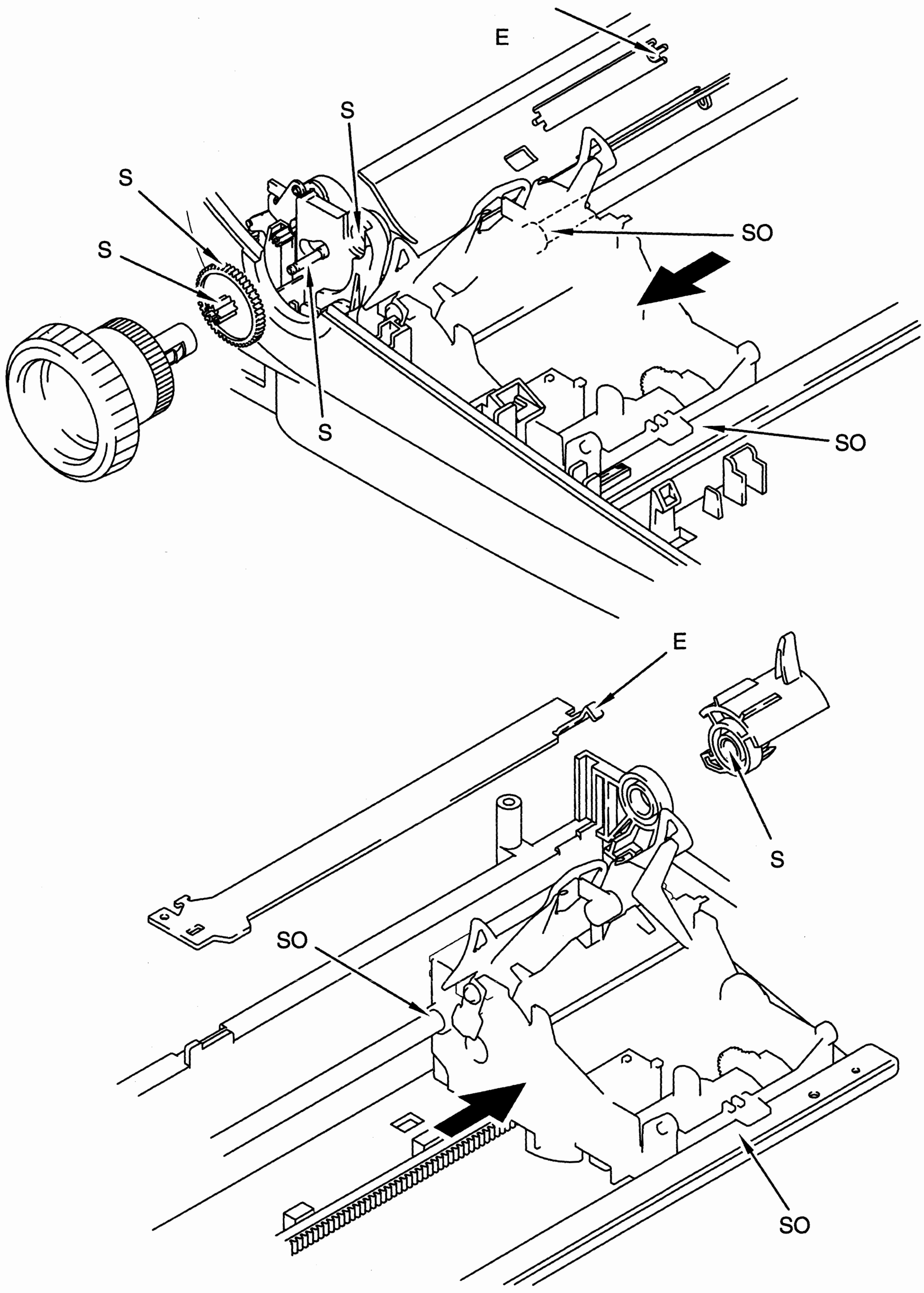


Fig. 3.4 Plate and carrier drive mechanism

Through the rear of the keyboard panel, apply silicon spray over the entire surface of the key stem insertion area (marked (A)). (This should be done after sub-stem guide has inserted.)

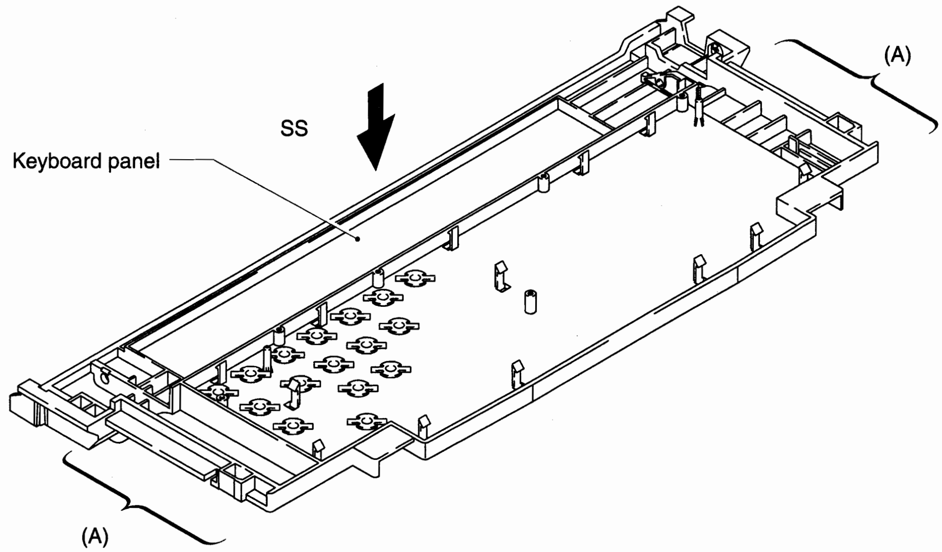


Fig. 3.5 Keyboard mechanism

Electronic Typewriter Service Manual
(Electronic Part)

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CHAPTER I THEORY OF OPERATION

1. GENERAL

1.1. Configuration of Electronic Part

Fig. 1.1 shows the configuration of the electronic part. The electronic part consists of the following PCBs:

1. Power supply PCB
2. Keyboard PCB
3. CPU PCB

1.2. Power Supply PCB

The power supply PCB converts the AC supply input into +8V DC (stable) and supplies this to the CPU PCB.

1.3. Keyboard PCB (an FPC board)

The keyboard PCB supplies the CPU PCB with the keyboard status data through the electrodes wired in the matrix on the keyboard PCB.

1.4. CPU PCB

The CPU PCB controls the motors, magnets, LED and all other parts according to the keyboard information supplied from the keyboard PCB.

The +8V DC supplied from the power supply PCB is used to drive the motors and magnets, and +5V DC converted from the +8V is used to drive the CPU, etc.

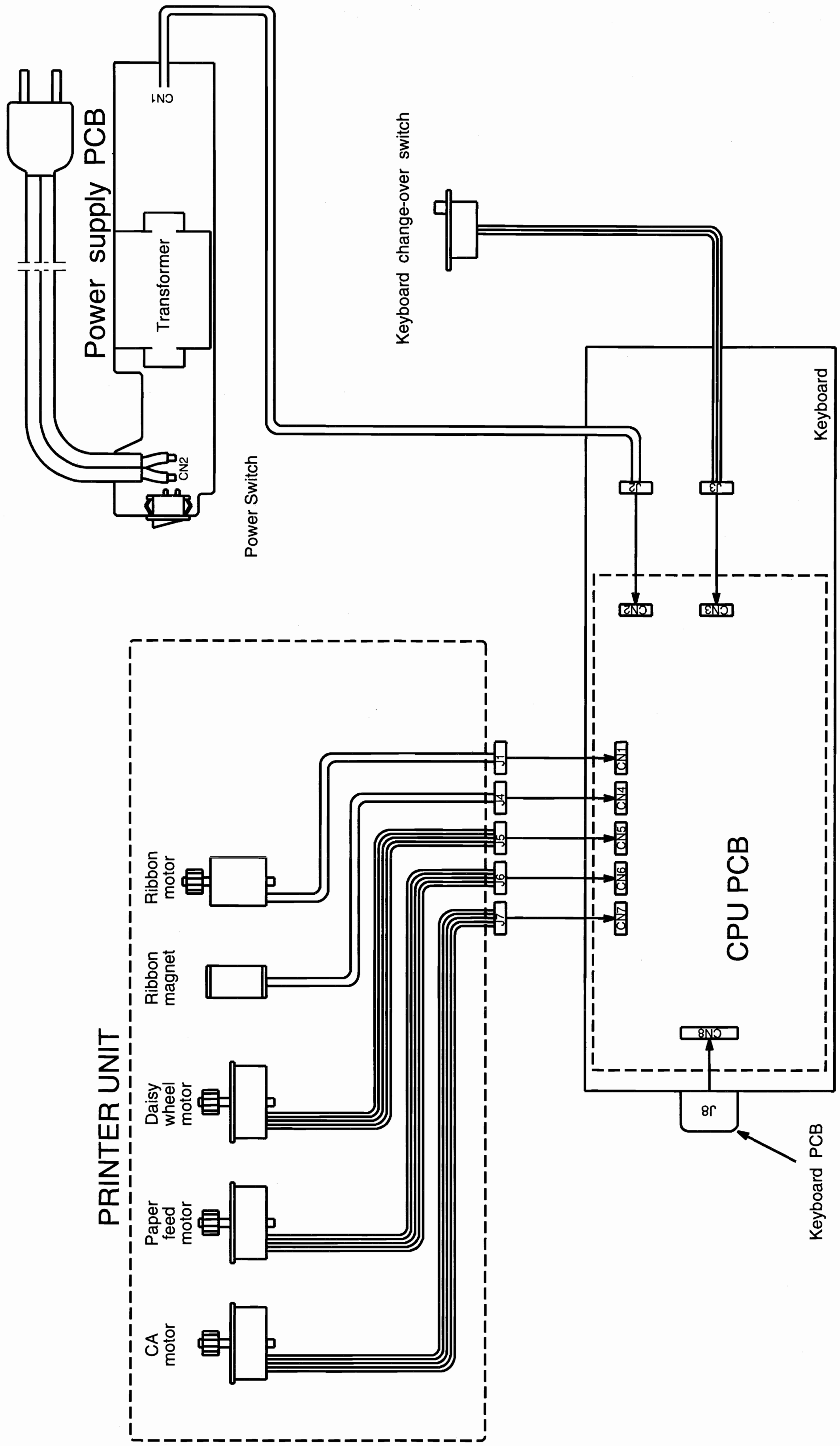


Fig. 1.1 Configuration of the Electronic Part

2. OPERATIONAL OUTLINE OF THE PARTS

The operational outlines of the motors, magnets, etc. illustrated in Fig. 1.1 are described below:

2.1. Daisy Wheel Motor

The daisy wheel motor turns the daisy wheel clockwise and counterclockwise through gears (gear ratio of 1:8) to select the desired characters. This is a 24-step, PM-type stepping motor.

2.2. CA Motor

The CA motor drives the head holder assy. This is a 24-step, PM-type stepping motor.

2.3. Paper Feed Motor

The paper feed motor feeds paper. This is a 24-step, PM-type stepping motor.

2.4. Ribbon Motor

The ribbon motor outputs driving power for the ribbon and correction tape winding, printing hammer striking and the correction tape lift operation.

2.5. Ribbon Magnet

The ribbon magnet engages and disengages the interlock of the ribbon motor with the cam for hammer operation, ribbon winding and lifting and winding the correction tape. The magnet also functions as an impact control for the hammer.

2.6. Keyboard Change-over Switch

The keyboard change-over switch is used for identifying the daisy wheel specifications and is operated on switching between daisy wheels.

3. CPU PCB (INCLUDING KEYBOARD PCB)

3.1. General

Fig. 1.2 shows the block diagram of the CPU PCB.

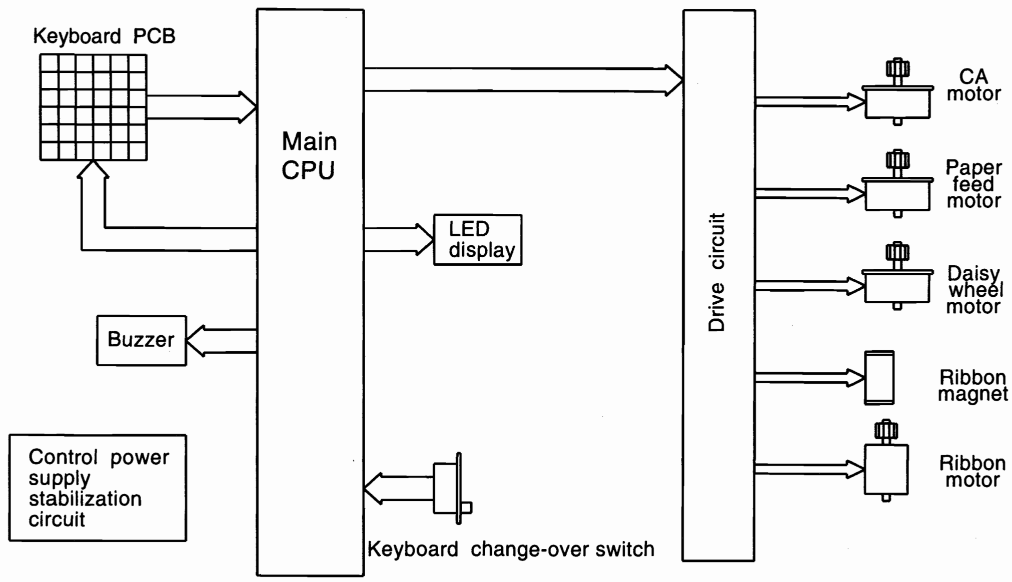


Fig. 1.2 CPU PCB Block Diagram

As illustrated above, the CPU PCB consists of the main CPU, as its core, and the drive circuits.

(1) Main CPU

The main CPU receives the data input from the keyboard PCB and the input from the keyboard change-over switch, and controls the motors and magnets through the drive circuit and the operations of the buzzer and the LED.

(2) Drive circuit

The drive circuit converts the signals for the motors and the magnets output from the main CPU into +8V drive signals and supplies these to the motors and magnets.

(3) Control power supply stabilization circuit

The control power supply stabilization circuit converts the +8V DC supplied from the power supply PCB into +5V and +8V DC, and supplies these to the elements.

3.2. Keyboard Configuration

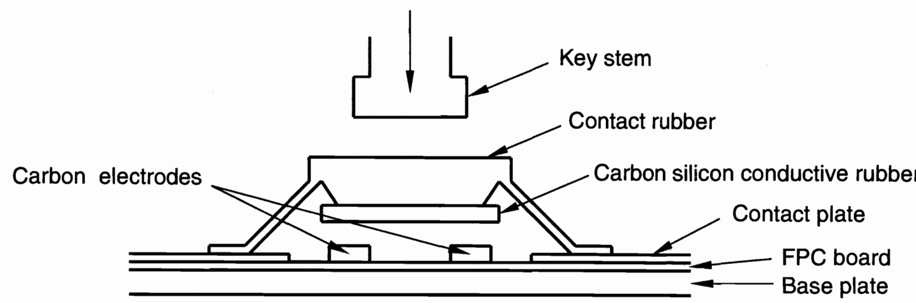


Fig. 1.3 Keyboard Configuration

Fig. 1.3 shows the keyboard configuration. The keyboard PCB is a flexible printed circuit (FPC), on which the circuit pattern and electrodes are printed. When a key is pressed, the key stem is lowered onto the contact rubber. The carbon silicon conductive rubber under the center of the contact rubber contacts the electrode on the FPC to close the circuit.

3.3. Keyboard Scanning

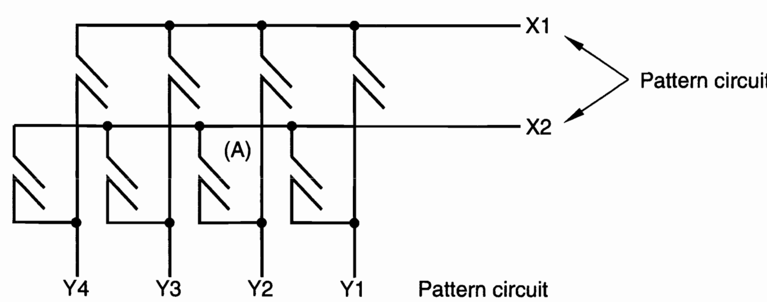


Fig. 1.4 Connection between Electrodes

As Fig. 1.4 shows, the electrodes on the PCB are connected on the matrix (the figure above shows only simplified wiring for ease of explanation and is slightly different from the actual wiring). Referring to Fig. 1.4, keyboard scanning operations are outlined as below:

When a key is not pressed, continuity does not exist between any combination on the matrix, such as X1 and Y1 or X1 and Y2. For example, if key (A) is pressed to close the circuit, continuity will exist only between X2 and Y2 and the others are left open. In other words, if continuity exists between X2 and Y2, it means that key (A) is being pressed.

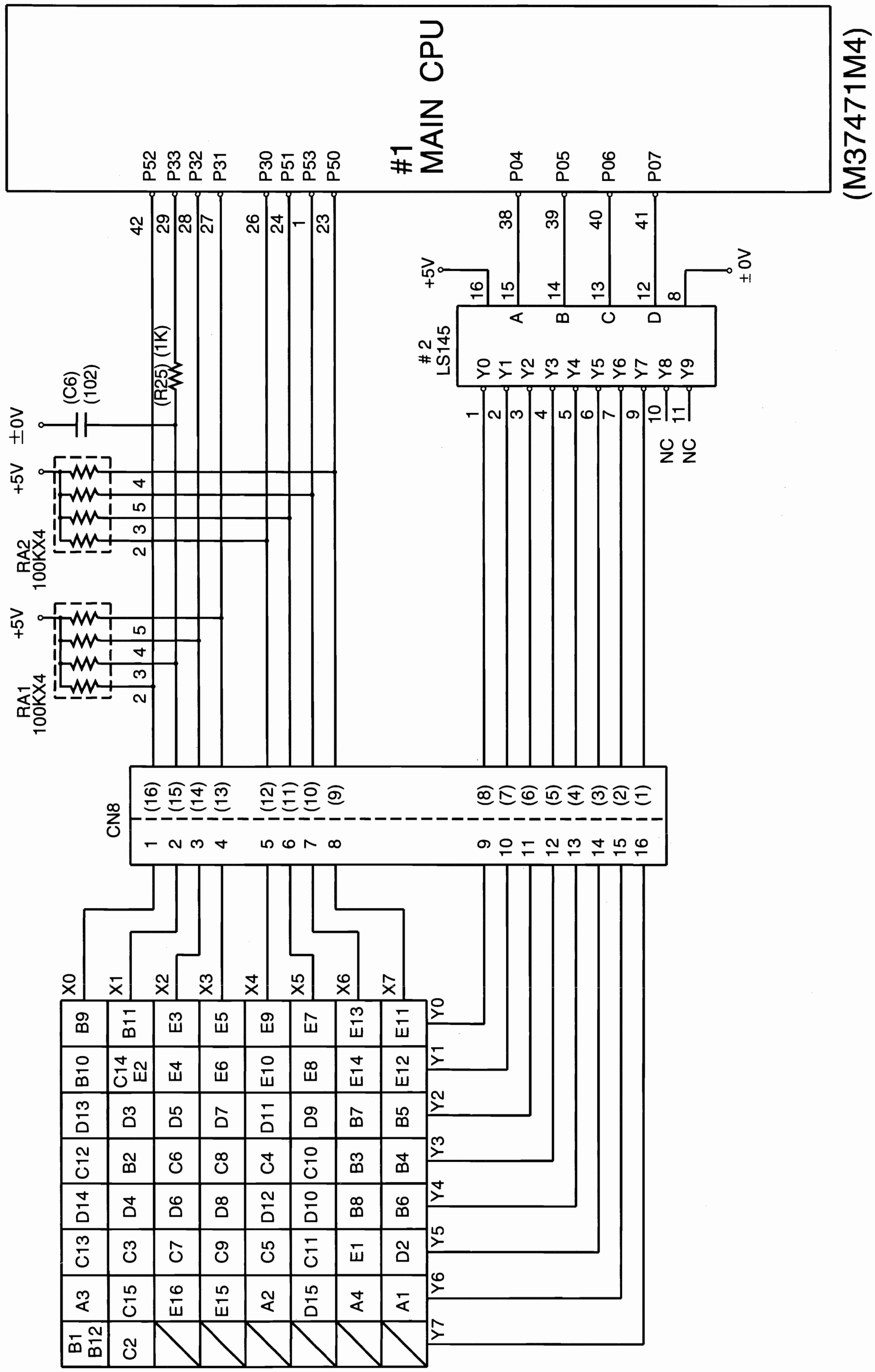


Fig. 1.5 Keyboard Circuit

Fig. 1.5 shows the keyboard circuit.

The CPU outputs scanning signals from P04 to P07. LS145 is a 4 to 10 decoder with Open-drain output. LS145 outputs scanning signals according to the CPU scanning signals, as shown in Fig. 1.7 to select Y0 to Y7.

P50 to P53 and P30 to P33 receive the inputs and signals of X0 to X7, which are output corresponding to signals Y0 to Y7, and are input to the CPU as they are.

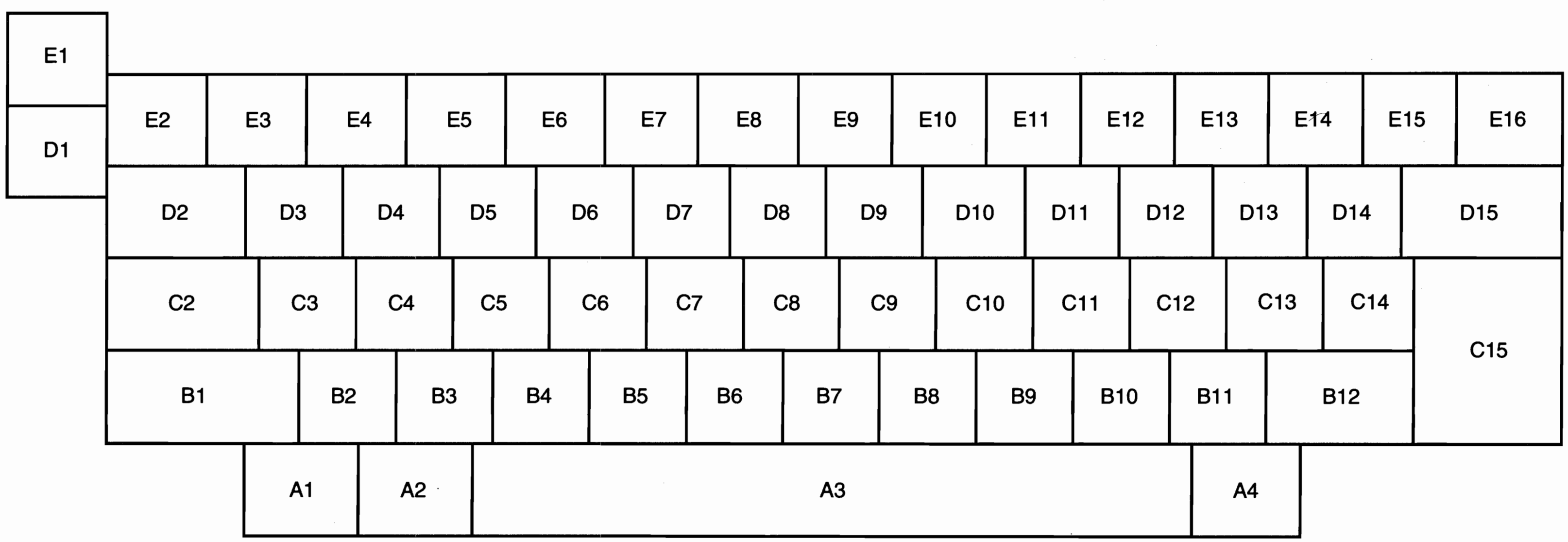
For example, if the key for C8 on the key matrix is pressed, the signal for Y3 is relayed at X3 but the others, X0, X1, X4 to X7, are maintained at a high level. Fig. 1.7 shows the process and Fig. 1.6 shows the key station symbols which correspond to the key matrix shown in Fig. 1.5

Carrier Index Switch

The carrier index switch is located on the keyboard. When the head holder assy locates the left end of chassis, index switch actuator moves and press the key matrix.

The switch is set so as to turn on between the 16th step and the 55th step of the 2-2 phase excitation of the CA motor from the left end of the chassis; it is basically assembled free of adjustment.

E1 on the key matrix corresponds to this switch.



The key station symbols correspond to the keyboard matrix symbols in Fig. 1.5

Fig. 1.6 Key station Symbols

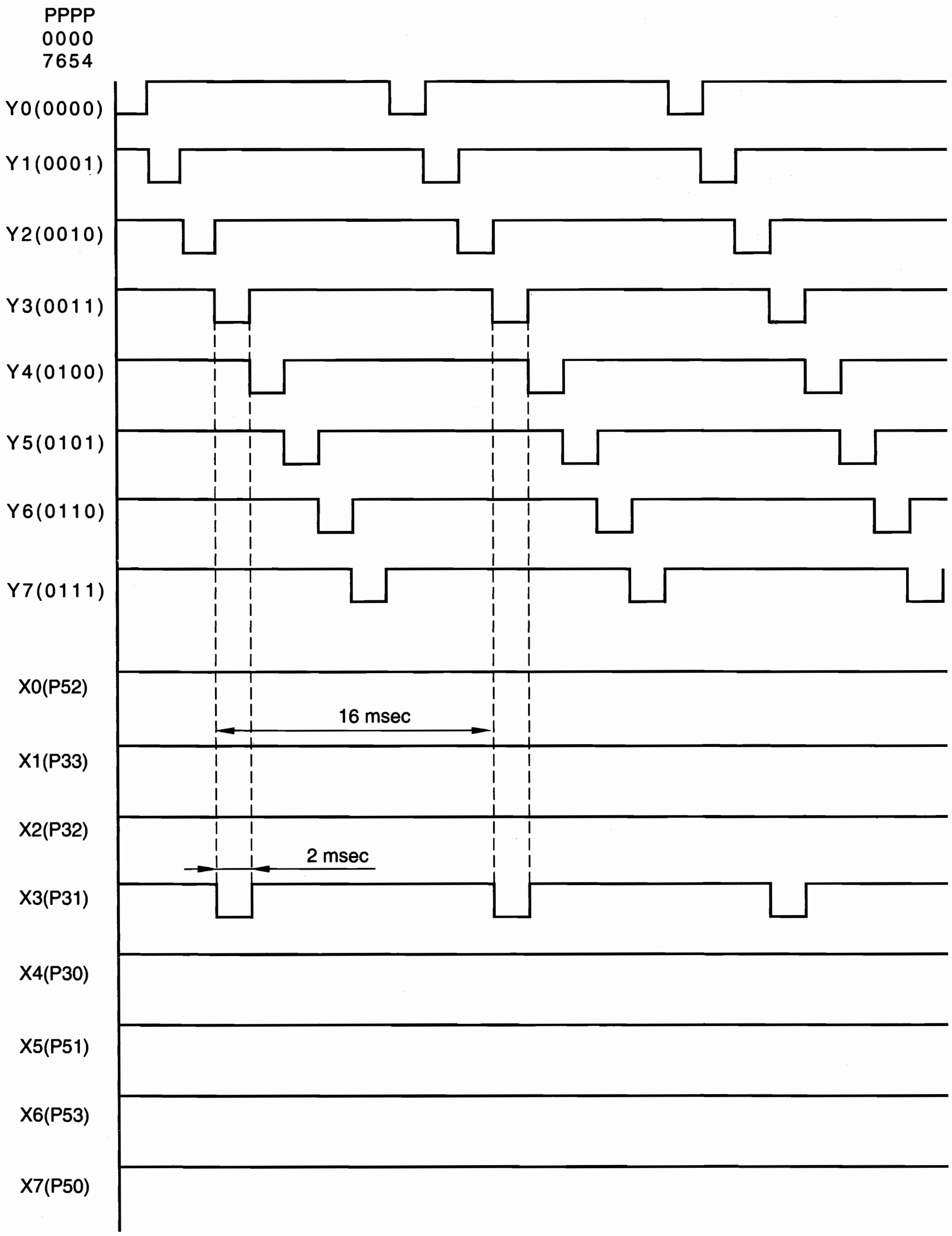


Fig. 1.7 Keyboard Scanning Signals

3.4. Daisy Wheel Motor Control

(1) Configuration

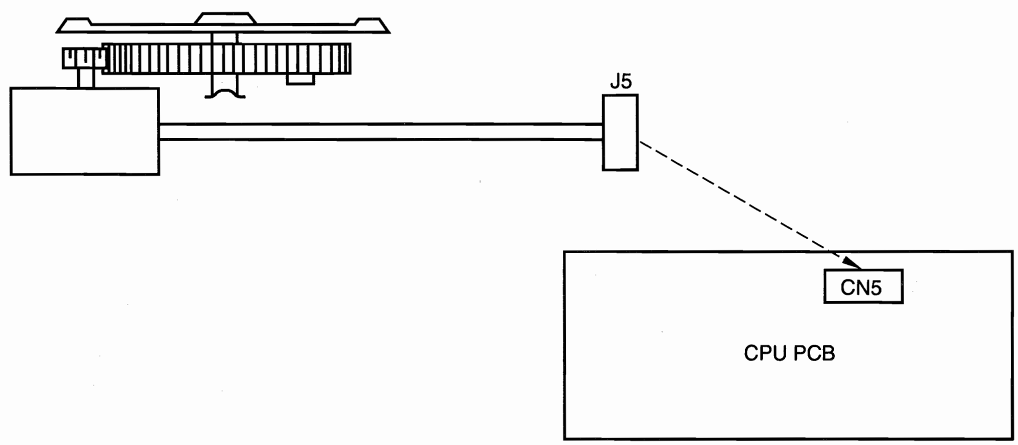


Fig. 1.8 Configuration of the Daisy Wheel Motor Unit

(2) Drive

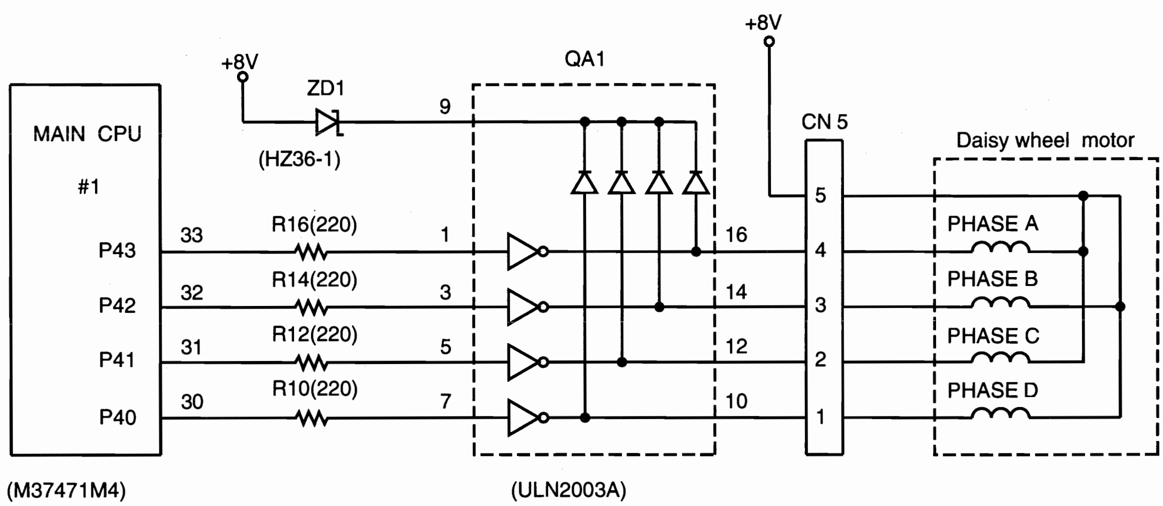


Fig. 1.9 Daisy Wheel Motor Drive Circuit

Fig. 1.9 shows the daisy wheel motor drive circuit. The motor unit, using a 4-phase (phases A, B, C and D), 24-step, PM-type stepping motor is controlled by the main CPU through transistor array QA1 which incorporates seven transistors. When wheel selection is required due to a key input, the main CPU outputs the following three different controls to the daisy wheel motor:

a) Pre-excitation

The phases are normally unexcited. Therefore, when it becomes necessary to rotate the daisy wheel, the phases which have been suspended are pre-excited to set the motor and the daisy wheel in the initial phase.

b) Pulsed output

The pulses are output in the sequence of phases AB - BC - CD - DA or the reverse. A 2-step, 2-2 phase output rotates the daisy wheel one spoke.

c) Damping

In the so-called damping status, the phases are stopped electrically but the motor shaft and the daisy wheel are not stopped. To control this status, the stopped phases are excited for a certain duration after the pulses are output.

During hammer operations, a drive voltage of +8V is supplied to stabilize daisy wheel detent. Fig. 1.10 shows a time chart of a sequence of 12 drive steps.

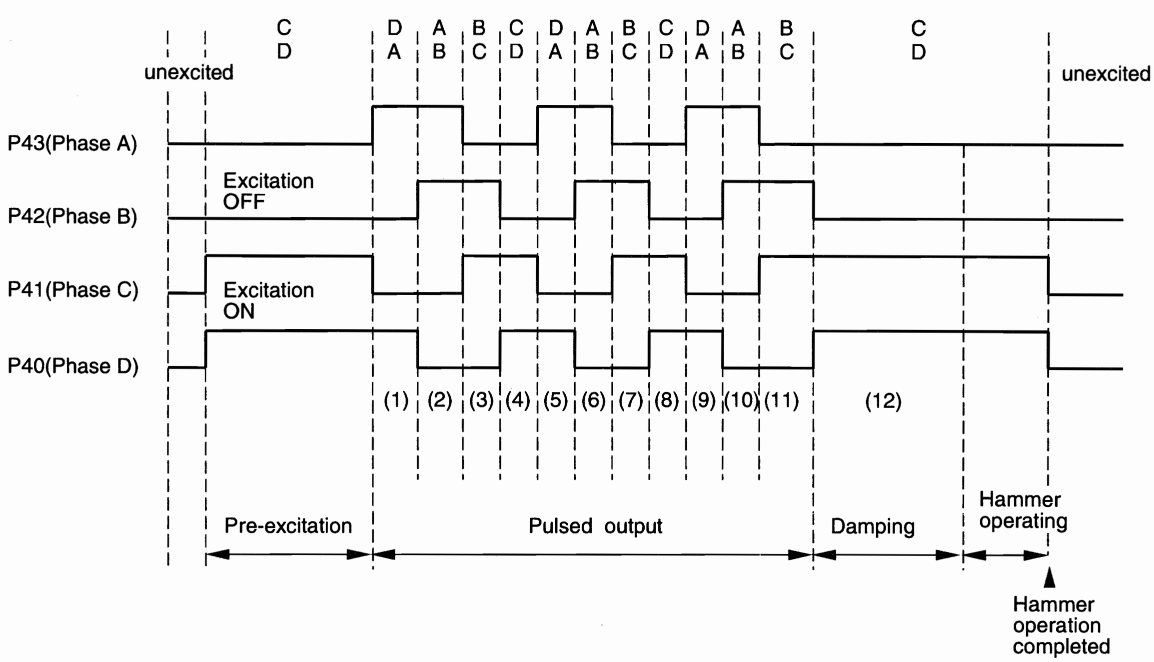


Fig. 1.10 Example of Daisy Wheel Motor Operation

3.5. Ribbon Motor Control

(1) Configuration

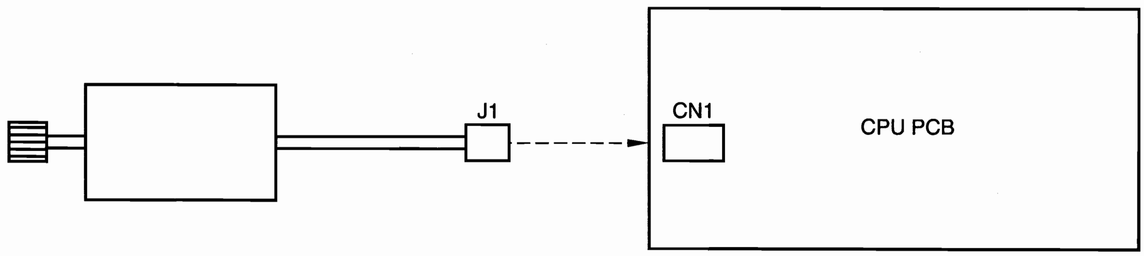


Fig. 1.11 Configuration of the Ribbon Motor Unit

Fig. 1.11 shows the configuration of the ribbon motor unit. The ribbon motor is the drive source for ink ribbon winding, correction operations and hammering operation. When the typewriter is on stand-by, the motor is stopped; it starts rotation when a key is pressed and reaches a constant running speed after an idle rotation period. It then carries out its various operations through clutch engagement. After rotating half a turn the clutch is stopped by a stopper and disengaged from the motor.

(2) Drive

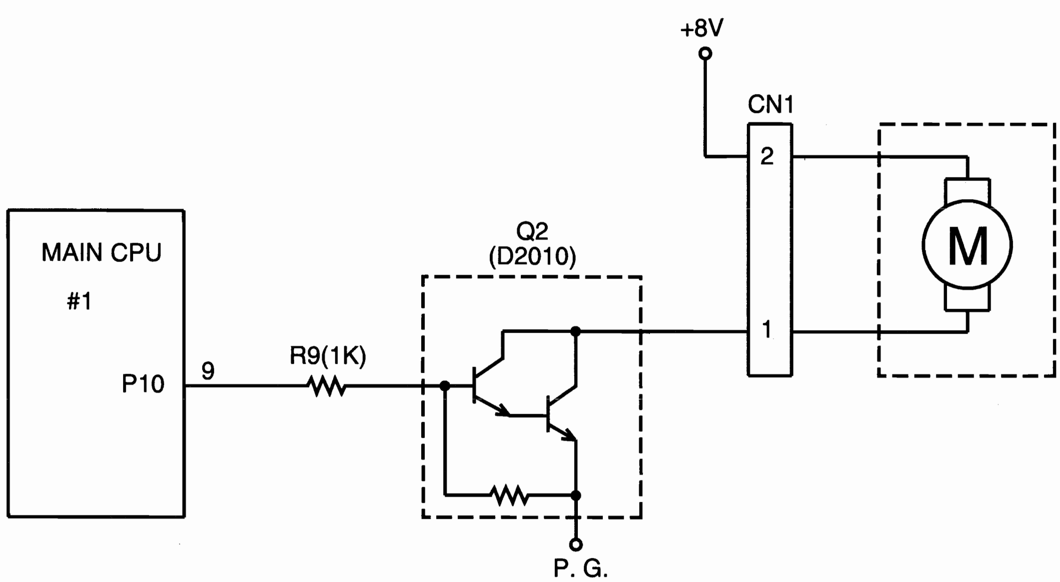


Fig. 1.12 Ribbon Motor Drive Circuit

Fig. 1.12 shows the ribbon motor drive circuit. A carbon-brush-type, 3-pole DC motor is used here and is controlled by the main CPU through transistor Q2. The ribbon motor is driven by +8V power and the signal at port P10 to a high level during motor rotation.

3.6. Ribbon Magnet Control

(1) Configuration

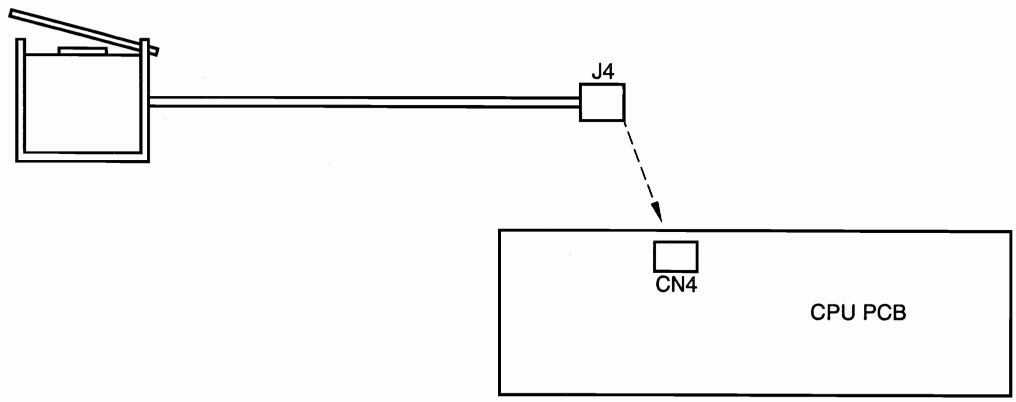


Fig. 1.13 Configuration of the Ribbon Magnet Unit

Fig. 1.13 shows the configuration of the ribbon magnet unit. The ribbon magnet functions as a trigger for the clutch which interlocks the ribbon motor with the hammer cam and with the lift cam. The hammer cam and the lift cam are changed by the mechanical motion. It also functions as a controller of the hammer impact control which is operated in two stages, light impact printing will result when the magnet is excited.

(2) Drive

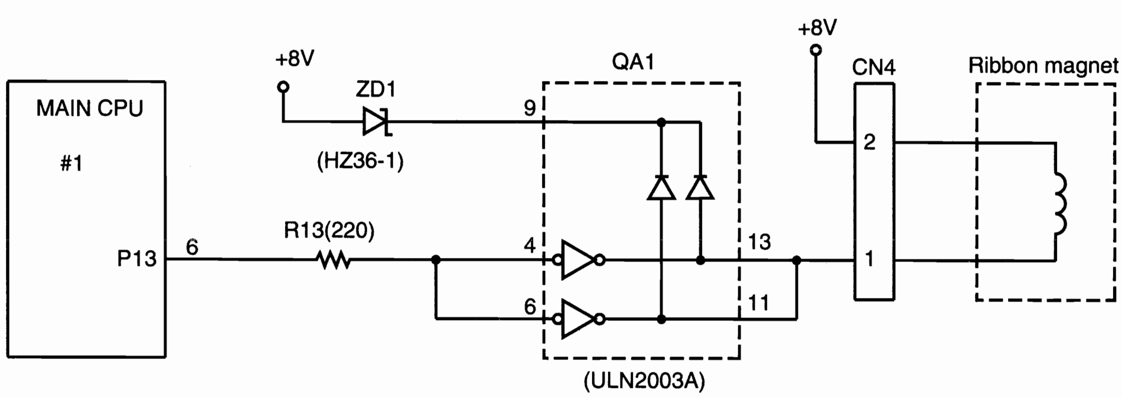
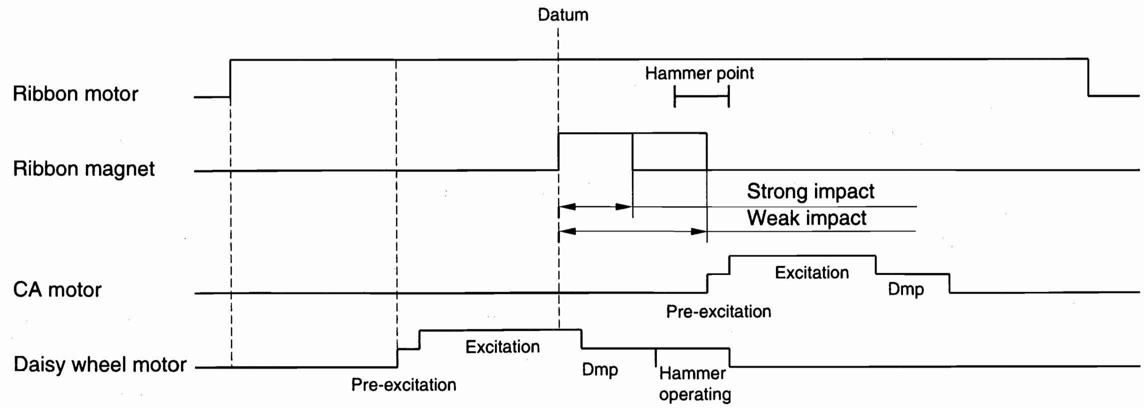


Fig. 1.14 Ribbon Magnet Drive Circuit

Fig. 1.14 shows the ribbon magnet drive circuit. When the signal at port P13 goes to a high level, the magnet is energized.

Fig. 1.15 shows the drive time chart.

a) Printing process



b) Correcting process

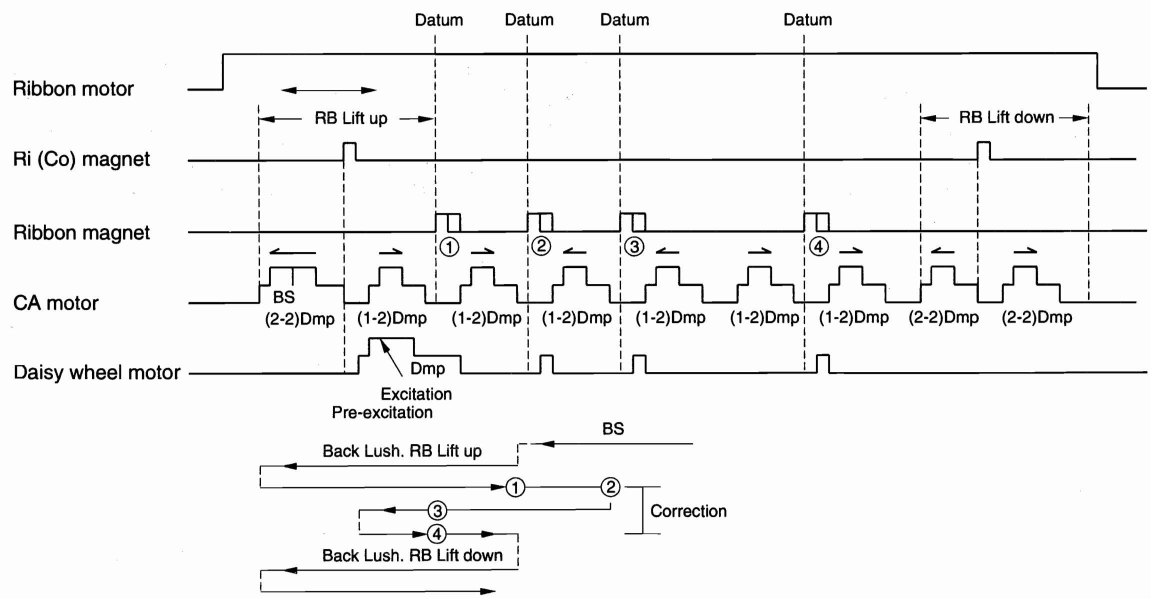


Fig. 1.15 Drive Time Charts of the Ribbon Motor Peripherals

3.7. Control of the Ribbon Motor Peripherals

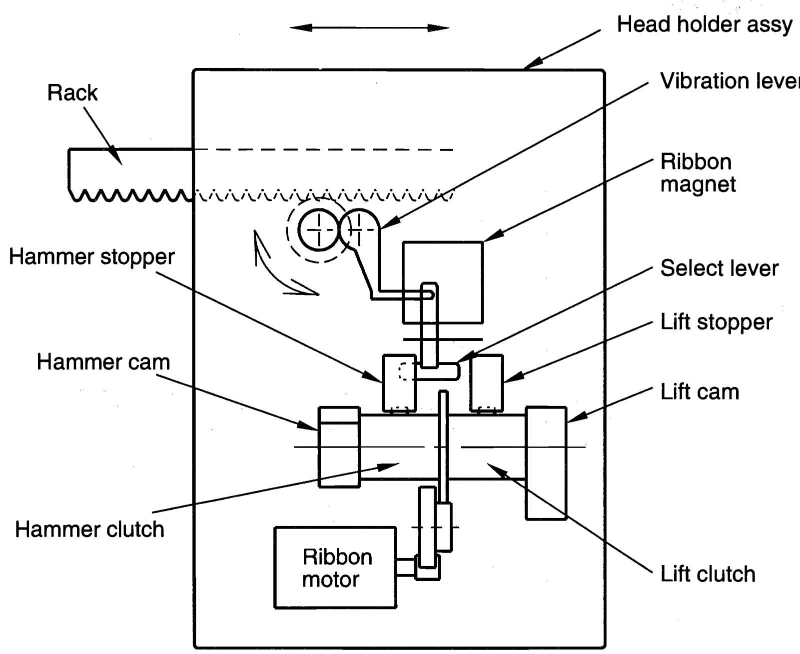


Fig. 1.16 Configuration of the Ribbon Motor Peripherals

Fig. 1.16 shows configuration of the ribbon motor peripherals. All mechanisms illustrated above operate in connection with the ribbon motor.

The ribbon motor is the driving power source for ribbon operation (including hammer impact control) and correcting operations.

When the print head moves to the right or left over the CA motor position, the vibration lever will move according to the movement which also moves the select lever.

When the print head moves in the LEND to REND direction, the select lever rests on the hammer stopper side. When the ribbon motor is rotated and the ribbon magnet is turned ON in this condition, the hammer stopper is released and the hammer clutch and the hammer cam rotate driven by the ribbon motor so that typing is performed.

When the print head moves in the REND to LEND direction, the select lever rests on the lift stopper side. When the ribbon motor is rotated and the ribbon magnet is turned ON in this condition, the lift stopper is released and the lift clutch and the lift cam rotate driven by the ribbon motor so that the lift tape lifts up and down.

3.8. CA Motor Control

(1) Configuration

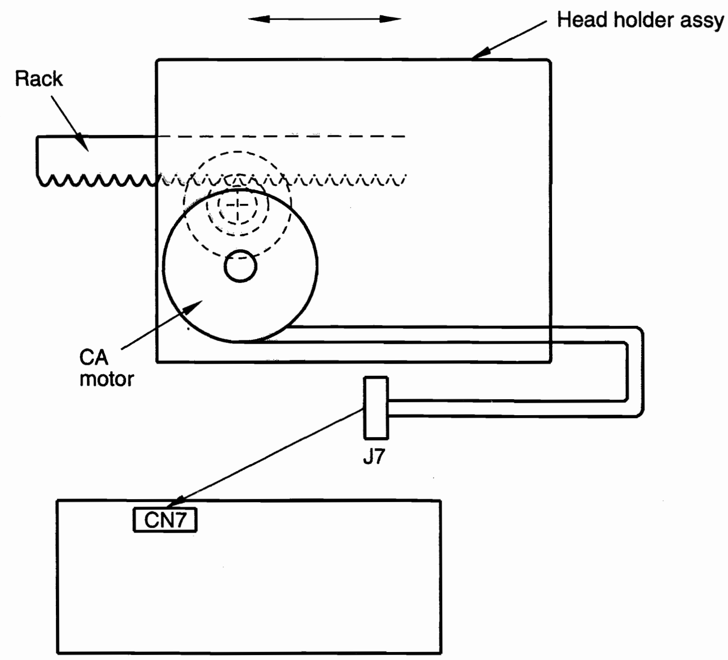


Fig. 1.17 Configuration of the CA Motor Unit

Fig. 1.17 shows configuration of the CA motor. The CA motor is a 4-phase, 24-step, PM-type stepping motor. When the power is switched on, the motor drives the head holder assy to the left until the carrier index is detected. The index switch which is on the keyboard acts as the datum to determine the position of the first character to be printed. The smallest increment of the movement the head holder assy can make is 1/120 inch.

The number of drive pulses for each pitch are as below:

Pitch	No. of pulses	Paper feed increment
Pica	12	1/10 inch
Elite	10	1/12 inch

Both pitches are driven by 2-2 phase excitation.

(2) Drive

Fig. 1.18 shows the CA motor drive circuit. The excitation phases of the step motor (A, B, C and D) are controlled by transistor array QA2 which incorporates seven transistors.

The CA motor, driven by +8V power, is controlled in the modes of pre-excitation, pulsed output and damping control, in the same way as the daisy wheel motor control.

Fig. 1.19 shows an example of CA motor operation in pica pitch.

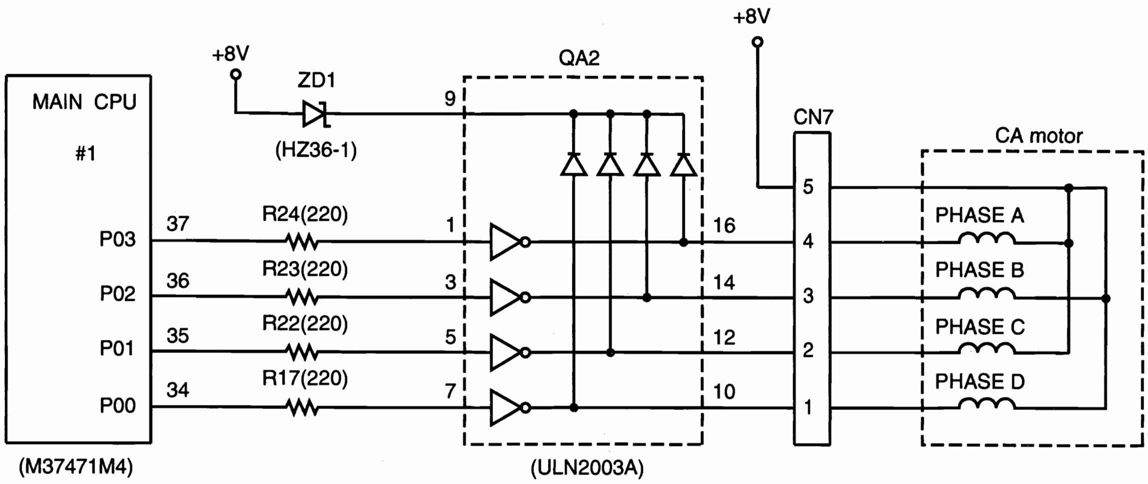


Fig. 1.18 CA Motor Drive Circuit

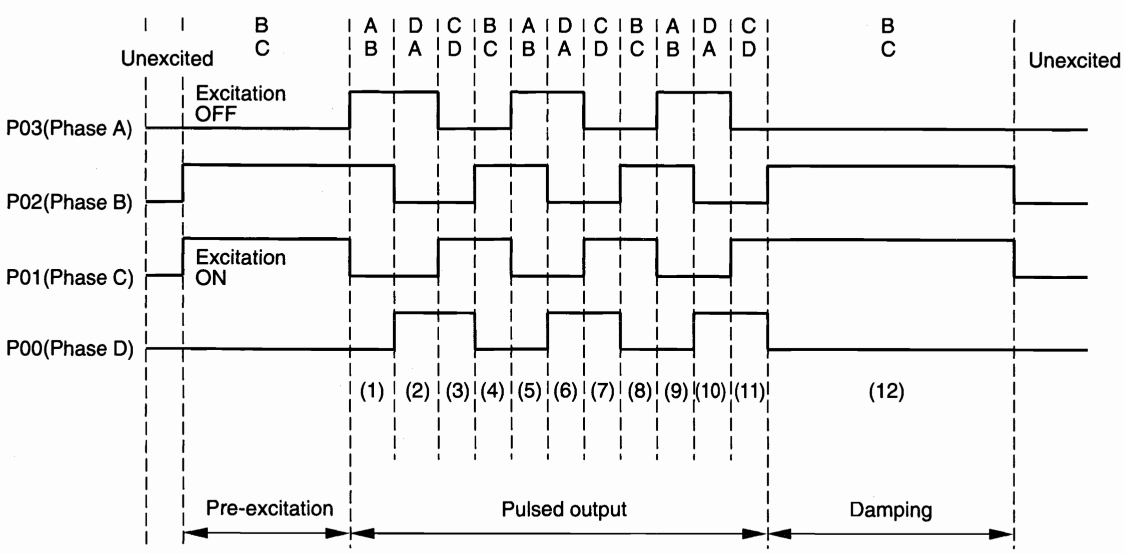


Fig. 1.19 Example of CA Motor Operation

3.9. Paper Feed Motor Control

(1) Configuration

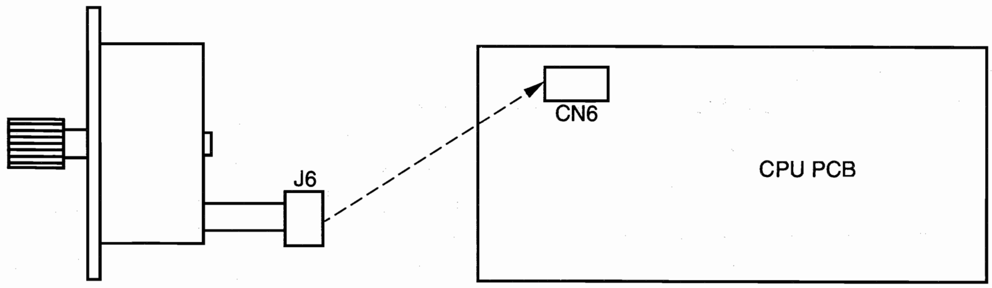


Fig. 1.20 Configuration of the Paper Feed Motor Unit

The paper feed motor is a 4-phase, 24-step, PM-type stepping motor. The motor is driven in 2-2 phase excitation by a +8V power supply for every operation. The motor is controlled so as to rotate in 2-2 phase and 32 steps for each line-spacing setting at 1/6 inch pitch. The line spacings available through the paper feed selector key or input from the keyboard are as below:

Paper Feed Pitch Selector	Feed Pitch	No. of Drive Pulses
1	1/6 inch	32
1 1/2	1/4 inch	48
2	1/3 inch	64

(2) Drive

Fig 1.21 shows the paper feed motor drive circuit. The excitation phases of the stepping motor (A, B, C and D) are controlled by transistor array QA1, 2 which incorporates seven transistors.

The paper feed motor is controlled in the modes of pre-excitation, pulsed output and damping control in the same way as the daisy wheel motor. Fig. 1.22 shows an example of 1/6 inch paper feed operation.

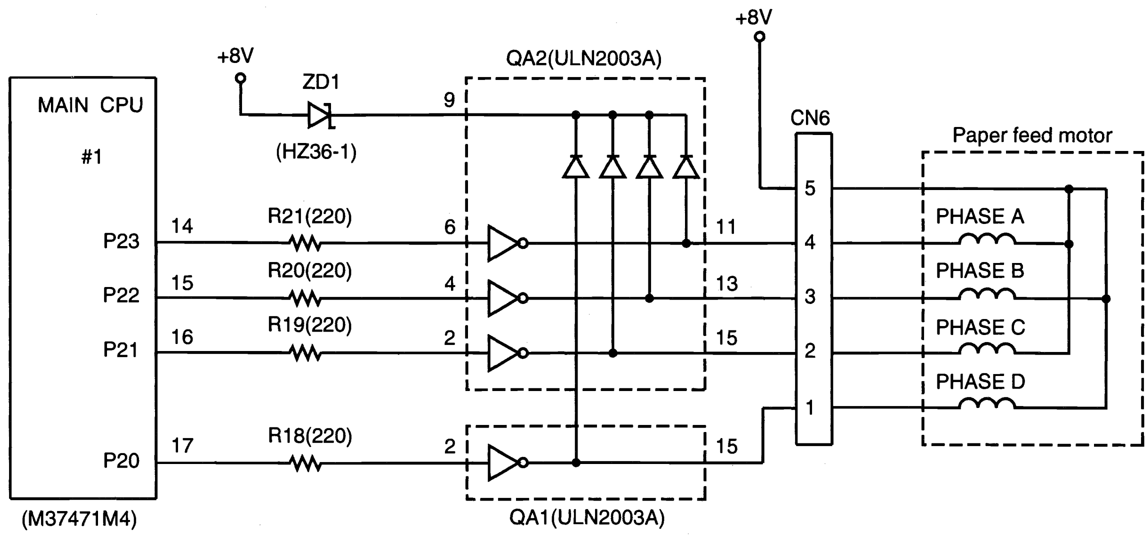


Fig. 1.21 Paper Feed Motor Drive Circuit

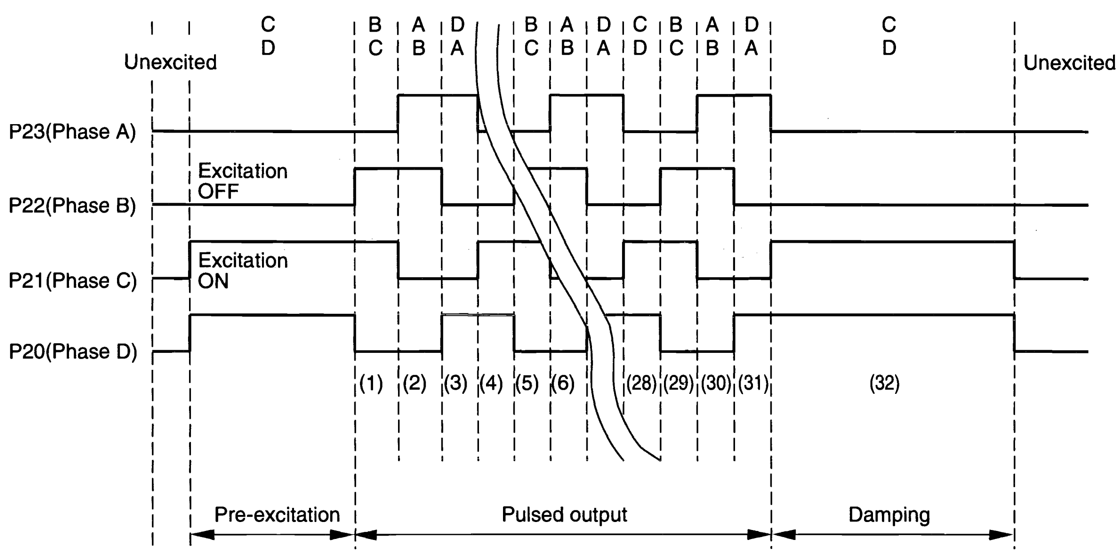


Fig. 1.22 Example of Paper Feed Motor Operation

3.10. Main CPU Peripheral Circuits

(1) Clock Circuit

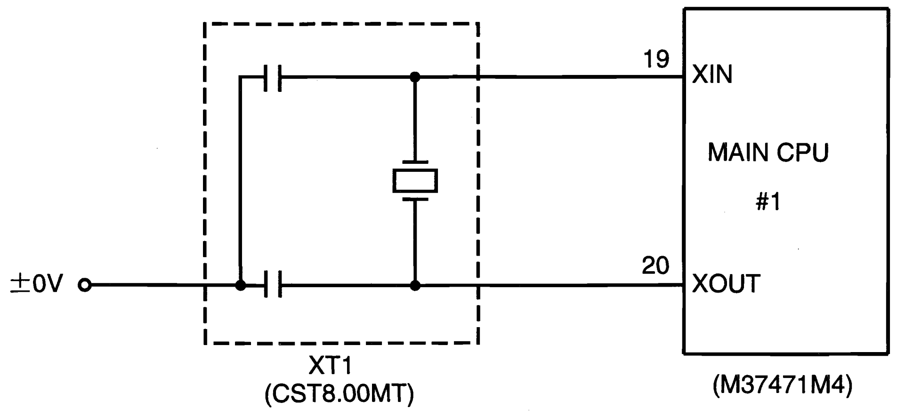


Fig. 1.23 Clock Circuit

Fig. 1.23 shows the circuit operating as a main CPU clock. The oscillated frequency is 8 MHz.

(2) Buzzer drive circuit

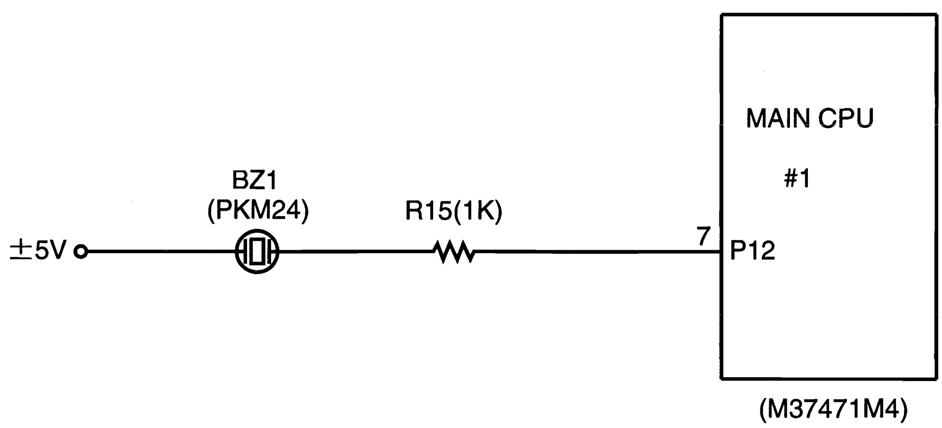


Fig. 1.24 Buzzer Drive Circuit

Fig. 1.24 shows the buzzer drive circuit. When buzzer operation is needed, the main CPU outputs 50% duty, 4 KHz-pulse on/off signal from its port and the piezoelectric element generates sound through this pulse. The signal level at the port is high when the buzzer is not in operation.

(3) LED activation circuit

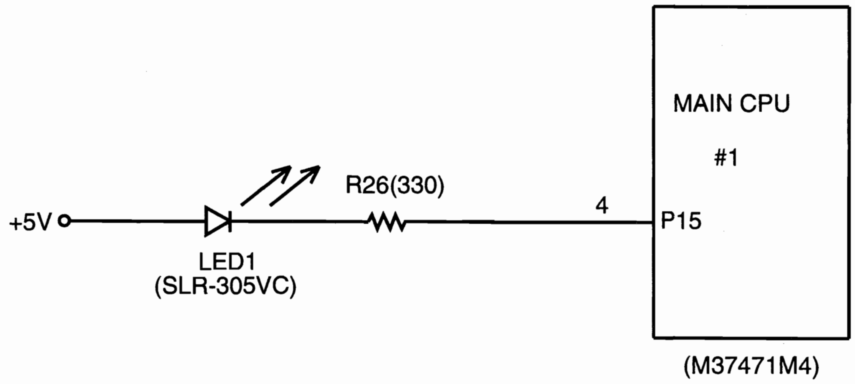


Fig. 1.25 LED Activation Circuit

Fig. 1.25 shows, the LED is activated by signals output from the main CPU. The LED is turned on when the signal level at the port is low.

(4) Reset circuit

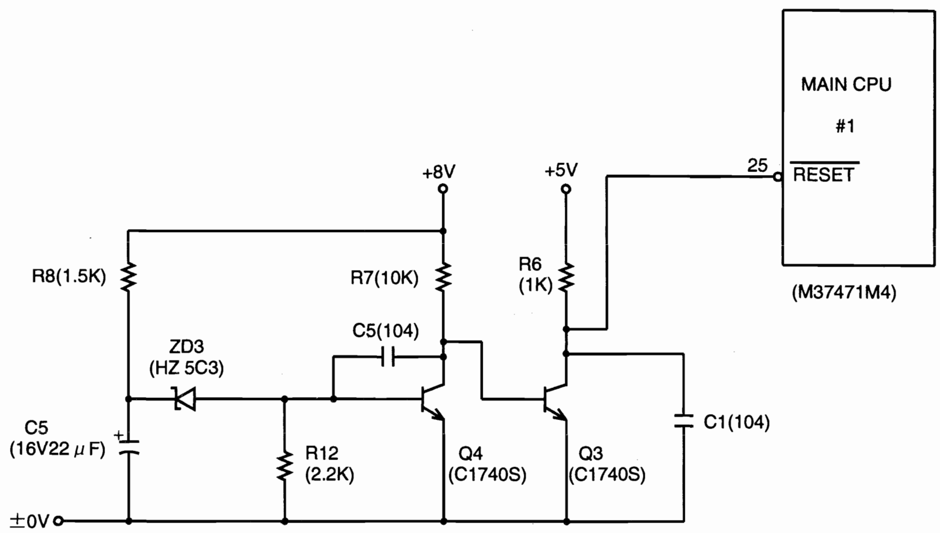


Fig. 1.26 Reset Circuit

Fig. 1.26 shows the reset circuit. This circuit resets the main CPU when the power is switched on. Simultaneously on switching the power on, the +8V circuit is energized and Q3 is on through R7 (10K). The reset signal level becomes low. When C6 is charged through R8 (1.5K) and the potential at C5 (22 μ) reaches approximately 6V, Q4 is on and Q3 is off to change the $\overline{\text{RESET}}$ signal level from low to high. This processing order is reversed when the power is switched off.

3.11. Specification Switcher

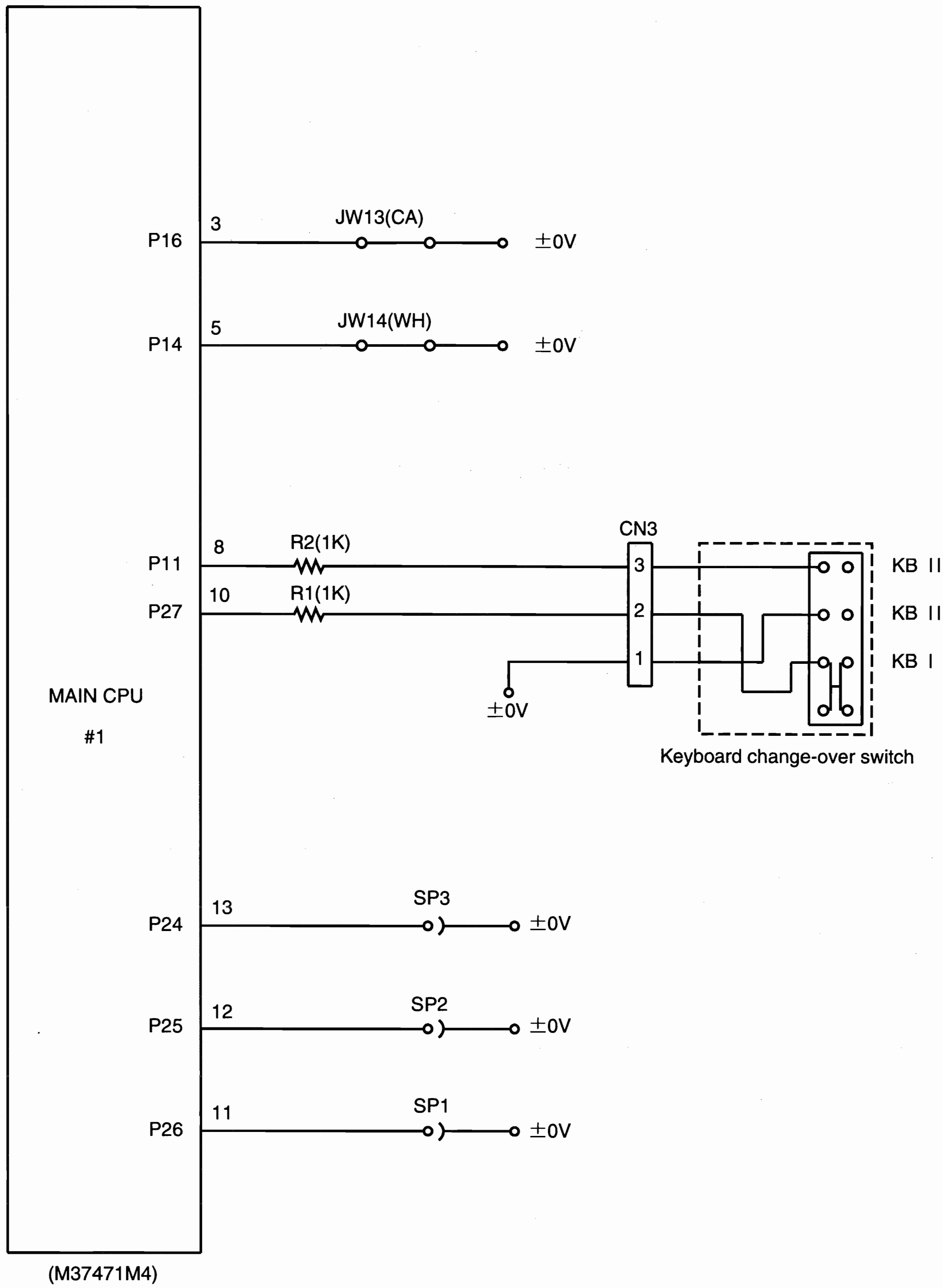


Fig. 1.27 Specification Switcher Circuit

Fig. 1.27 shows the specification switcher circuit. The solder points SP1 through SP3 and the keyboard change-over switches used to alter country specifications. Close JW13 (CA) and JW14 (WH), which are normally opened, expand the motor power limits.

3.12 CPU Power Supply Circuit

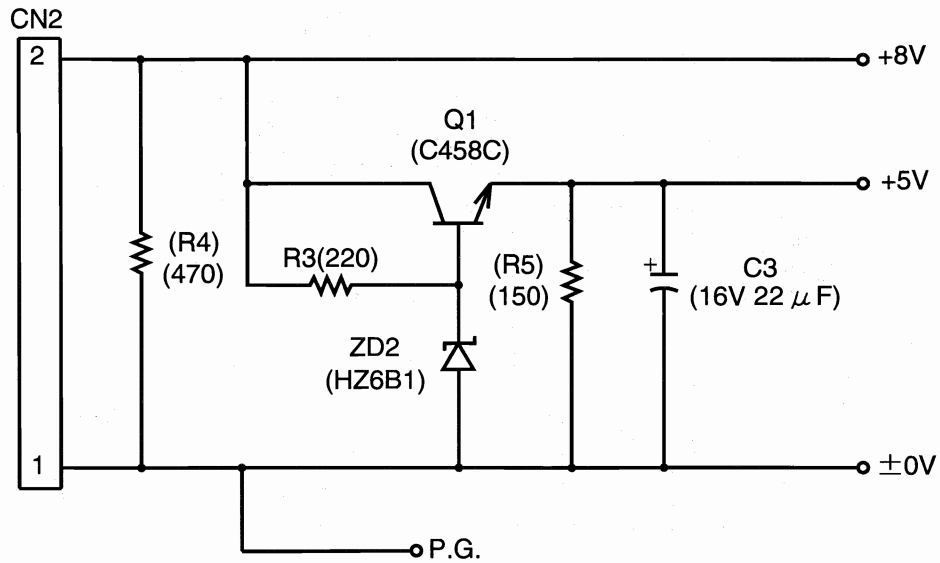


Fig. 1.28 CPU Power Supply Circuit

Fig. 1.28 shows the CPU power supply circuit. The power supplied from the power supply PCB through CN2 is delivered to each part through this circuit. +8V is divided and some power is supplied directly to the drive units, and the remainder is supplied to the control units after regulated to +5V by Transistor Q1.

The output voltage of Q1 is set by ZD2.

3.13 Home Position Indexing Operations

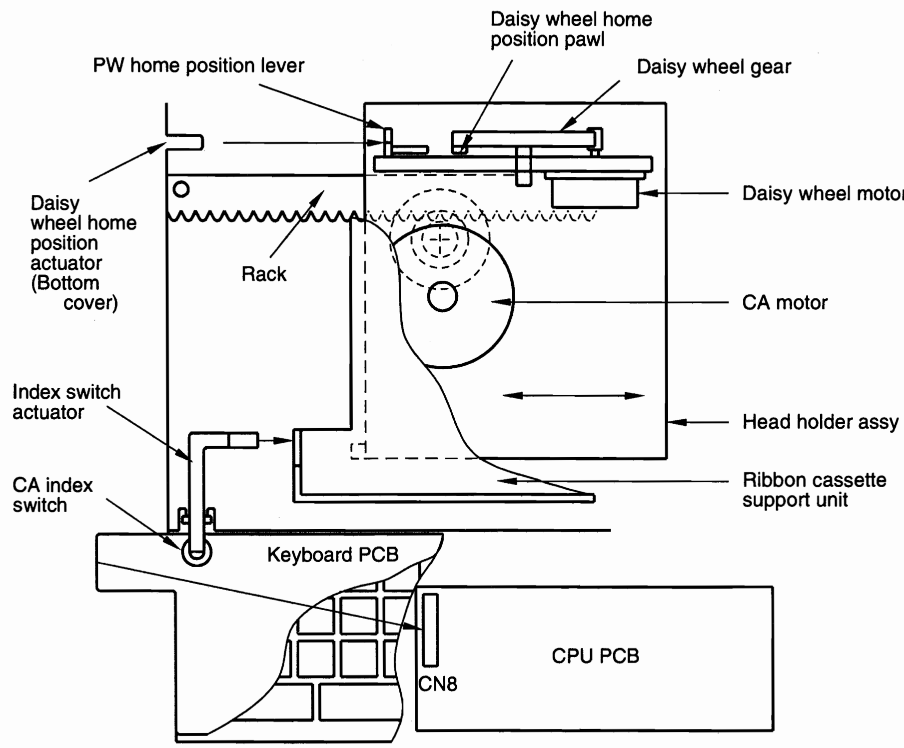
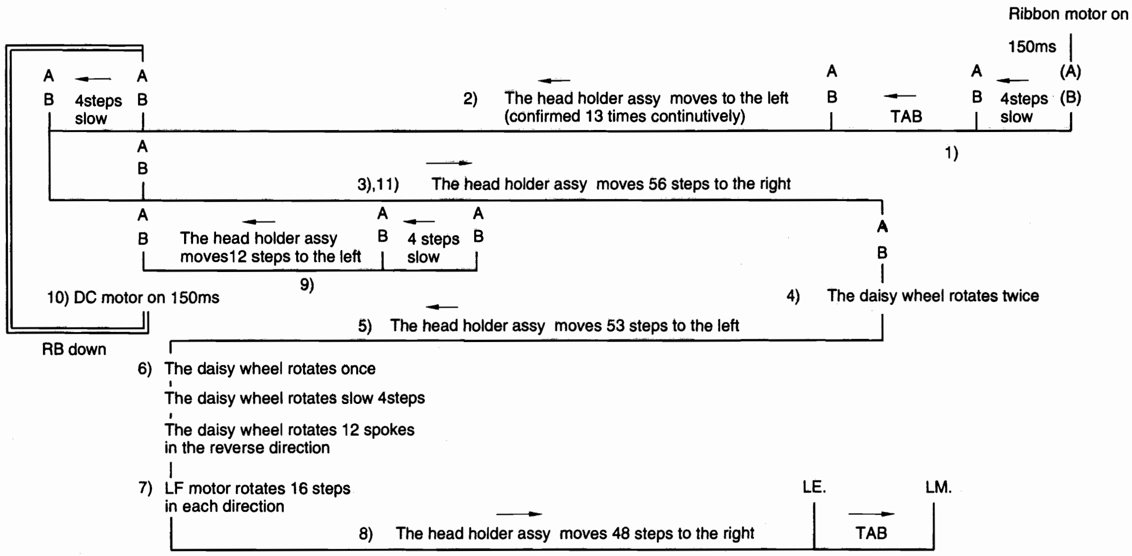


Fig.1.29 Configuration of the head holder assy



1) 150 msec after the ribbon motor is turned on, the head holder assy moves to the left (the on status is confirmed).

2) The head holder assy motor moves to the left (the on status is confirmed 13 times continitively).

3) The head holder assy moves 56 steps to the right.If the SW is ON, go to step 9.

(1) Normal status (SW off)

4) The daisy wheel rotates twice (a daisy wheel pin is set).

5) The head holder assy moves 53 steps to the left.

6) The daisy wheel rotates once (the daisy wheel home position is at ",").
The daisy wheel rotates through 12 spokes in the reverse direction (the daisy wheel stops at the letter "h" position).

7) The paper feed backlash is corrected (by moving the platen both up and down for 16 steps in each direction).

8) The head holder assy moves to the left margin (LM).

(2) Correction RB lift status (SW ON)

9) The head holder assy moves 12 steps to the left.

10) 150ms after the ribbon motor is turned on, Ri (CO magnet on 17 ms) and Ribbon down.

11) The head holder assy moves 56 steps to the right. If the SW is ON, Buzzer rings.
(Home position detecting error)
If the SW is OFF, go to step 4.

4. POWER SUPPLY PCB

4.1 Configuration

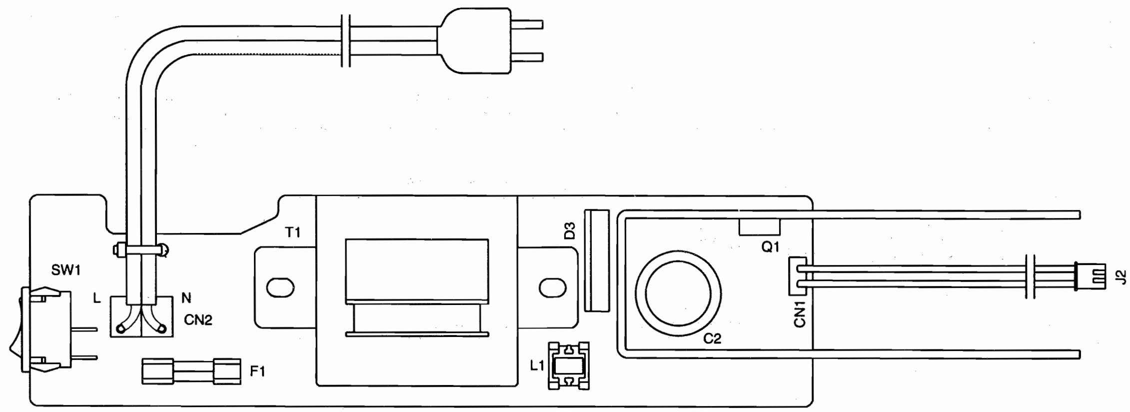


Fig. 1.30 Configuration of the Power Supply Unit

Fig. 1.30 shows the configuration of the power supply unit.

The AC input power is supplied to the transformer through switch SW1 and fuse F1. The AC voltage output from the secondary side of the transformer is rectified and smoothed though filter L1 into +8V and finally supplied to the CPU PCB.

4.2 Power Supply Circuit

Fig. 1.31 shows the power supply circuit. The AC voltage on the primary side is converted and 12V to 14V AC is generated on the secondary side. This AC voltage is converted into approximately 12V DC by rectifier bridge D3 and capacitor C2.

This voltage is converted into +8V by the regulation circuit.

The output voltage (+8V) of Q1 is set by R2, D2 and ZD1.

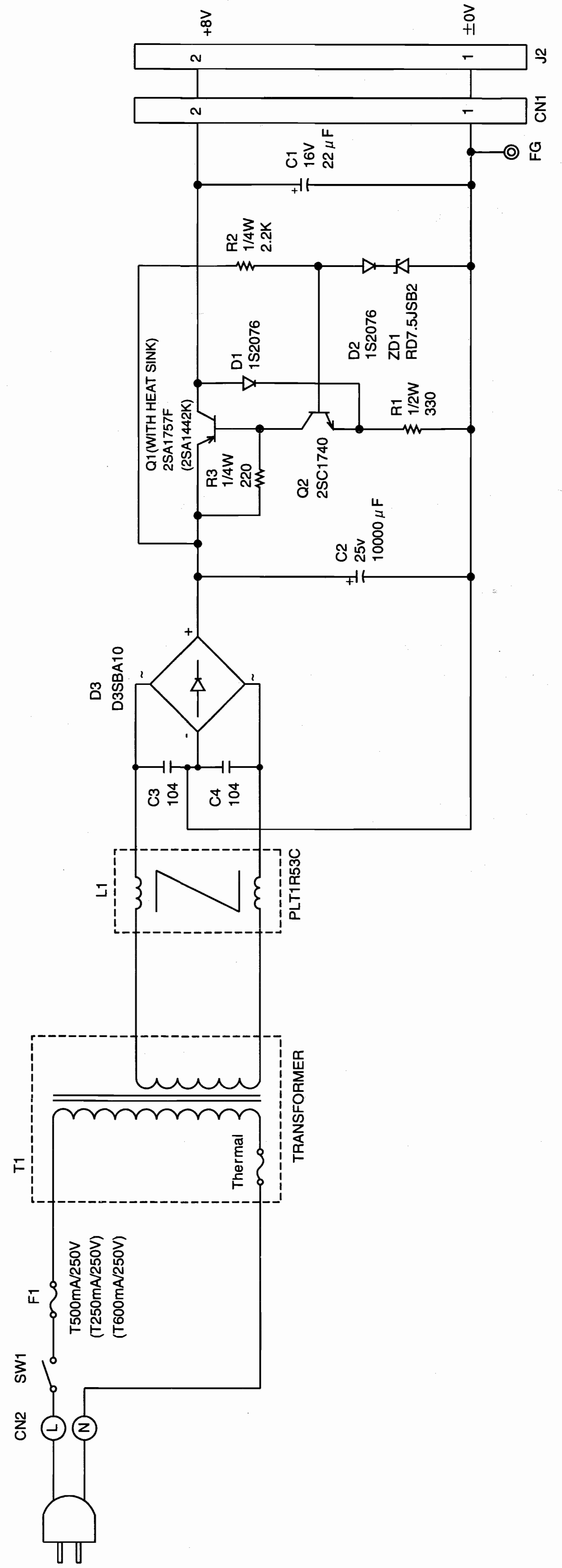


Fig. 1.31 Power Supply Circuit

CHAPTER II TROUBLESHOOTING

1. GENERAL

This section describes methods for finding the possible causes of typewriter troubles. As it is impossible to tell when and how a trouble will occur, it is very difficult to establish trouble-shooting procedures by assuming such troubles. Therefore, described here are limited examples but it is necessary to understand the functions of each block beforehand to be prepared for actual trouble so that you can roughly understand the malfunctioning part by studying the trouble analytically.

2. PRECAUTIONS

Be sure to observe the following precautionary instructions for safety during repair work:

(1) Unplug the power cord from the AC receptacle before removing the cover, adjusting any mechanical parts or removing the PCBs, etc

(2) Unplug the power cord from the receptacle before checking continuity with a tester.

(3) Do not pull on the lead cable when disconnecting a connector (hold the connector body).

3. CHECKING AFTER REPAIRS

After finding a cause of a trouble and repairing it, always test the unit to confirm that the trouble has been fully resolved by the repair work.

It is recommended to keep a record of the trouble-shooting procedures in each specific case for utilization in the future.

4. PRIMARY CHECK ITEMS

Check the following items as primary check items when trouble occurs:

(1) Check the supply voltage

The AC supply voltage and DC supply voltage for each part are as specified.

(2) Check the connector connections

Check that every connector connection exists and is secured.

(3) Check the fuses

Check for any blown fuse (F1 and the thermo-fuse inside the transformer).

5. CONTENTS OF THE TROUBLESHOOTING TABLES

No.	Error Modes
1	No response on switching the power on (none of the LED illuminates).
2	The LED illuminates on switching the power on but the head holder assy does not start home position indexing operations.
3	The head holder assy moves to the left after switching the power on but the home position cannot be indexed (a home position indexing error).
4	Key entry is not always available; or some key entries are disabled.
5	Abnormal daisy wheel motor rotation (e.g., wrong characters are printed).
6	The hammer does not strike (Ribbon motor does not start).
7	The hammer does not strike and the ribbon is not wound on (but the Ribbon motor rotates).
8	Abnormal paper feed motor rotation.
9	The correction tape does not lift when correcting; the correction tape is not wound on.
10	Printing is too light or too dark.
11	The LED does not illuminate.
12	The buzzer does not sound.

Troubleshooting Tables (1)

	Error Mode	Check Items	Causes	Countermeasures	Repair	Manual
1	No response on switching the power on (none of the LED illuminates)	Are the AC power cord, secondary-side power cord and all the harnesses connected correctly?	Improper harness connection			
		Is the supply voltage applied between L and N of CN2 on the power supply PCB?	Wire break in the AC power cord	Replace the power supply PCB assembly	Replace the power cord	4. POWER SUPPLY PCB
		Is the supply voltage applied on the primary side of transformer T1 on the power supply PCB?	Defective power switch SW1	Replace the power supply PCB assembly	Replace SW1 after checking for no conductivity	
		Is the voltage output on the secondary side of transformer T1 on the power supply PCB (ca. 13 V AC output with a rated input while the typewriter is idling)?	Defective transformer: • Wire break • Thermo-fuse blown		Replace the transformer after checking for no conductivity	
		Is the secondary voltage applied on the output side of coil L1 on the power supply PCB?	Defective coil L1		Replace L1 after checking for no conductivity	
		Is the DC voltage applied across capacitor C2 on the power supply PCB (ca. 16V DC with a rated input while the typewriter is idling)?	Defective diode bridge D3	Replace the power supply PCB assembly	Replace D3	
			Defective capacitors C3 and C4		Replace C3 and C4	
		Is fuse F1 on the power supply PCB blown?	Defective reference voltage circuit		Replace F1, Q2, ZD1	
		Is the voltage at the both ends of capacitor C2 ± 0V?	Defective transformer		Replace T1	

Troubleshooting Tables (2)

	Error Mode	Check Items	Causes	Countermeasures	Repair	Manual
1	No response on switching the power on (none of the LED illuminates)	Is the voltage at the both ends of Zener diode ZD1 about 7.5V?	If Yes, transistor Q1 is faulty.	Replace the power supply PCB.	Replace Q1	4. POWER SUPPLY PCB
			If No, Zener diode ZD1 is faulty.		Replace ZD1	
		Is 8V DC output between pins 1 and 2 of J2 on the power supply harness assembly when connector CN2 on the CPU PCB is unplugged?	Wire break in the power supply harness assembly		Replace the power supply harness assembly after checking for non-continuity	
		Is 8V DC applied between pins 1 and 2 of connector CN2 on the CPU PCB when the connector is connected?	Short circuit in 8V DC line of the CPU PCB	Replace the CPU PCB		3.12 CPU Power Supply Circuit
		(1) Are the circuits free of overheated parts?	Defective element		Replace the element	
		(2) Are the circuits free of solder bridges and solder chips?	Solder bridge		Remove the solder bridge or the solder chip	
		Is +5V DC applied between the ± 0V line and emitter of transistor Q1 on the CPU PCB?	Defective transistor Q1	Replace the CPU PCB	Replace Q1	
			Short circuit in the 5V DC line			
		(1) Are the circuits free of overheated parts?	Defective element		Replace the element	
		(2) Are the circuits free of solder bridges and solder chips?	Solder bridge		Remove the solder bridge or the solder chip	

Troubleshooting Tables (3)

	Error Mode	Check Items	Causes	Countermeasures	Repair	Manual
1	No response on switching the power on (none of the LED illuminates)	Is the signal level at pin 25 (for $\overline{RESET}$ input) of CPU #1 on the CPU PCB high?	Faulty $\overline{RESET}$ circuit	Replace the CPU PCB		3.10 Main CPU Peripheral Circuits
		Is the signal level at the collector of Q3 high?	Short circuit in the $\overline{RESET}$ line			
		Is the signal level at the collector of Q4 low?				
		Is an oscillating waveform output at X-IN (pin 19) and X-OUT (pin 20) of CPU #1? (Check with a synchronized oscilloscope)	Troubles in or around the oscillation circuit:	Replace the CPU PCB Assembly		
			• Defective oscillator XT1		Replace XT1	
			• Solder bridge, etc.			
			Defective CPU #1		Replace CPU #1	

Troubleshooting Tables (4)

	Error Mode	Check Items	Causes	Countermeasures	Repair	Manual
2	The LED illuminates on switching the power on but the head holder assy does not start home position indexing operations	Are CA motor drive pulses output from P03 (pin 37), P02 (pin 36), P01 (pin 35) and P00 (pin 34)? (Check with a synchronized oscilloscope)	Defective CPU #1 (or defective QA2 preventing the level from going high)	Replace the CPU PCB	Replace CPU #1 (or replace QA2)	3.8 CA Motor Control
		Is output at the output pin of transistor array QA2 turned on and off according to the drive pulses mentioned above?	Defective QA2, or defects somewhere (e.g., wire break)			
		(1) Is the +8V supply voltage applied on pin 5 of connector CN7?	+8V supply failure (pattern break)	Replace the CPU PCB		
		(2) Is the resistance between the COM terminal of the CA motor and each phase normal?	Wire break in the CA motor assembly:(Wire break in the motor) (Defective connector)	Replace the CA motor assembly		
		(3) Is the voltage output from QA2 normal?	Defective QA2	Replace the CPU PCB	Replace QA2	

Troubleshooting Tables (5)

	Error Mode	Check Items	Causes	Countermeasures	Repair	Manual
3	The head holder assy moves to the left after switching the power on but the home position cannot be indexed (a home position indexing error)	Are the key stem and contact rubber correctly fitted?	Faulty keyboard assembly	Replace the keyboard	Reassemble the keyboard	3.3 Keyboard Scanning 3.8 CA Motor Control
		Is the keyboard PCB securely connected to connector CN8?	Incorrect installation	Connect the PCB securely		
		Is home indexing completed when the carrier index switch is pressed?	If there is an error (buzzer ON), the keyboard PCB or CPU PCB is faulty.	Replace the keyboard PCB or CPU PCB		3.13 Home Position Indexing Operations
			If there is no problem, a mechanical failure exists.	Refer to the Service Manual (Mechanical Part).		
		(1) Is output Y5 of LS145 #2 LOW when the output of P04 to P07 of CPU #1 is "0101"?	Defective LS145 #2	Replace the CPU PCB	Replace LS145 #2	3.2 Keyboard Configuration
		(2) Is the signal level of P53 of CPU #1 LOW when the switch is manually input and Y5 of LS145 #2 is LOW?	Pattern break in the keyboard FPC	Replace the keyboard PCB		
		(3) Is head holder assy stopped when the signal level of P53 of CPU #1 becomes LOW?	Defective CPU #1	Replace the CPU PCB	Replace CPU #1	
		Are CA motor drive pulses output from P03 (pin 37), P04 (pin 36), P01 (pin 35) and P00 (pin 34)? (Check with a synchronized oscilloscope)	Defective CPU #1 (or defective QA2 preventing the level from going high)	Replace the CPU PCB	Replace CPU #1 (or replace QA2)	
		Is output at the output pin of transistor array QA2 turned on and off according to the drive pulses mentioned above?	Defective QA2	Replace the CPU PCB	Replace QA2	

Troubleshooting Tables (6)

	Error Mode	Check Items	Causes	Countermeasures	Repair	Manual
4	Key entry is not always available; or some key entries are disabled	Are the key stem and contact rubber correctly fitted?	Faulty keyboard assembly	Replace the keyboard	Reassemble the keyboard	3.2 Keyboard Configuration
		Is the keyboard PCB securely connected to connector CN8?	Incorrect installation	Connect the PCB securely		
		When an ineffective key is held down, does the signal level at the line for the key in the key matrix go low in synchronization with the timing of the output from CPU #1?	Wire break in the keyboard PCB	Replace the keyboard PCB		3.3 Keyboard Scanning
			Circuit pattern break in the CPU PCB	Replace the CPU PCB assembly		
		Are low level signals input to P30 to P33 (pins 26 to 29) and P50 to P53 (pins 1, 23, 24 and 42) of CPU #1 during one key scanning cycle even when none of the keys are pressed?	If "yes", a short circuit in the key matrix circuit	Replace the CPU PCB assembly	Check the short circuit on the CPU PCB	
		Does the status remain the same even if the keyboard PCB is disconnected from connector CN8?	If "yes", a short circuit in the CPU PCB			
			If "no", a short circuit in the keyboard PCB	Replace the keyboard PCB assembly		
		Is the signal level of Y0 to Y7 of LS145 #2 at one selected line LOW according to the output of P04 to P07 of CPU #1?	Defective LS145 #2	Replace the CPU PCB assembly	Replace LS145 #2	
		Is the printed character always different from the one indicated on the key top?	Incorrect keyboard change-over switch setting or defective solder point.	Set the keyboard chang-eover switch correctly.		3.11 Specification Switcher
				Replace the CPU PCB		

Troubleshooting Tables (7)

	Error Mode	Check Items	Causes	Countermeasures	Repair	Manual
5	Abnormal daisy wheel motor rotation (e.g.,wrong characters are printed)	Are daisy wheel motor drive pulses output form P43 (pin 33), P42 (pin 32), P41 (pin 31) and P40 (pin 30) of CPU #1 on key entry?	Defective CPU #1 (or defective QA1 preventing the level from going low)	Replace CPU PCB assembly	Replace the CPU #1 (or replace QA1)	3.4 Daisy Wheel Motor Control
		Is output at transistor array QA1 turned on and off according to the drive pulses mentioned above?	Defective QA1, defective circuits (e.g., wire break)			
		(1) Is the supply voltage of +8 applied on pin 5 of connector CN5?	+8 V supply failure (pattern break)	Replace the CPU PCB assembly		
		(2) Is the resistance between the COM terminal of the daisy wheel motor and each phase normal?	Wire break in the daisy wheel motor assembly: (Wire break in the motor) (Defective connector)	Replace the daisy wheel motor assembly		
		(3) Is the output voltage level of QA1 normal?	Defective QA1	Replace the CPU PCB assembly	Replace QA1	
		Is the printed character always different from the one indicated on the key top?	Incorrect keyboard change-over switch setting or defective solder point.	Set the keyboard change-over switch correctly.		3.11 Specification Switcher
				Replace the CPU PCB	Resolder	
		Check the relevant mechanical parts				

Troubleshooting Tables (8)

	Error Mode	Check Items	Causes	Countermeasures	Repair	Manual
6	The hammer does not strike (Ribbon motor does not start)	Are ribbon motor drive pulses output from P10 (pin 9) of CPU #1 on key entry?	Defective CPU #1 (or defective Q2 causing abnormal signal level)	Replace the CPU PCB assembly	Replace CPU #1 (or replace Q2)	3.5 Ribbon Motor Control
		Is the collector output at transistor Q2 turned on and off according to the drive pulses mentioned above?	Defective Q2 or defective circuits (e.g. wire break) and defective R9 (e.g., wire break)	Replace the CPU PCB assembly	Replace transistor Q2	3.7 Control of the Ribbon Motor Peripherals
		(1) Is the supply voltage of +8V applied on pin 2 of connector CN1?	+8V supply failure (pattern break)	Replace the CPU PCB assembly		
		(2) Does the resistance between poles remain infinite even when the Ribbon motor is rotated by hand?	Wire break in the ribbon motor assembly: (Wire break in the motor)(Defective connector)	Replace the ribbon motor assembly		
		Is the output voltage level of Q2 normal?	Defective Q2	Replace the CPU PCB assembly	Replace Q2	

Troubleshooting Tables (9)

	Error Mode	Check Items	Causes	Countermeasures	Repair	Manual
7	The hammer does not strike and the ribbon is not wound on (but the ribbon motor rotates)	Are ribbon magnet drive pulses output from P13 (pin 6) of CPU #1 on key entry?	Defective CPU #1 (or defective QA1 causing the abnormal signal level)	Replace the CPU PCB assembly	Replace CPU #1 (or replace QA1)	3.6 Ribbon Magnet Control
		Are the outputs at transistor array QA1 (pins 11 and 13) turned on and off according to the drive pulses mentioned above?	Defective QA1 or defective circuits and defective R13	Replace the CPU PCB assembly	Replace QA1	3.7 Control of the Ribbon Motor Peripherals
		(1) Is the supply voltage of +8V applied on pin 2 of connector CN4?	+8V supply failure (pattern break)	Replace the CPU PCB assembly		
		(2) Is the resistance between the poles of the ribbon magnet normal?	Wire break in the ribbon magnet assembly: (Wire break in the magnet) (Defective connector)	Replace the ribbon magnet assembly		
		(3) Is the output voltage level of QA1 normal?	Defective QA1	Replace the CPU PCB assembly	Replace QA1	
		Check the relevant mechanical parts				

Troubleshooting Tables (10)

	Error Mode	Check Items	Causes	Countermeasures	Repair	Manual
8	Abnormal paper feed motor rotation	Are paper feed motor drive pulses output from P23 (pin 14), P22 (pin 15), P21 (pin 16), P20 (pin 17) of CPU #1 on key entry?	Defective CPU #1 (or defective QA2 and QA1 preventing the level from going low)	Replace the CPU PCB assembly	Replace CPU #1 (or replace QA1 and QA2)	3.9 Paper Feed Motor Control
		Is output at transistor array QA1 and QA2 turned on and off according to the drive pulses mentioned above?	Defective QA1 and QA2, defective circuits (e.g., wire break)	Replace the CPU PCB assembly	Replace QA1 or QA2	
		(1) Is the supply voltage of +8V applied on pin 5 of connector CN6?	+8V supply failure (pattern break)	Replace the CPU PCB assembly		
		(2) Is the resistance between the COM terminal and each phase of the paper feed motor normal?	Wire break in the paper feed motor assembly: (Wire break in the motor) (Defective connector)	Replace the paper feed motor assembly		
		(3) Is the output voltage level of QA2 normal?	Defective QA2	Replace the CPU PCB assembly	Replace QA2	
		(4) Is the output voltage level of QA1 normal?	Defective QA1	Replace the CPU PCB assembly	Replace QA1	
		Check the relevant mechanical parts				

Troubleshooting Tables (11)

	Error Mode	Check Items	Causes	Countermeasures	Repair	Manual
9	The correction tape does not lift when correcting; the correction tape is not wound on	Does the hammer strike and the head holder assy operate correctly when printing?	If normal, a mechanical failure exists. Check relevant mechanical parts.			3.7 Control of the Ribbon Motor Peripherals
			If the hammer does not strike, check [6] and [7] .			
			If the head holder assy has a problem, check [2] .			
10	Printing is too light or too dark	Is the Ribbon magnet drive pulse width normal?	Defective CPU #1	Replace the CPU PCB assembly	Replace CPU #1	3.6 Ribbon Magnet Control
		Check the relevant mechanical parts.				3.7 Control of the Ribbon Motor Peripherals

Troubleshooting Tables (12)

	Error Mode	Check Items	Causes	Countermeasures	Repair	Manual
11	LED does not illuminate	Is the LED polarity correct?	Incorrect packaging of the LED	Replace the CPU PCB assembly	Repackage the LED	3.10 Main CPU Peripheral Circuits
		Is the LED activation signal level output from LED1 (pin 4) of CPU #1 normal?	Defective CPU #1 or defective R26 (e.g., wire break)		Replace Cpu #1 or replace R26	
		Is there a potential of c.a.2V between the terminals of the LED?	Defective LED1		Replace the LED1	
12	The buzzer does not sound	Are pulses of c.a. kHz applied to the ± 0 V terminal of buzzer BZ1 (c.a. 0 V for low level and c.a. 5 V for high level)?	Defective CPU #1	Replace the CPU PCB assembly	Replace CPU #1	3.10 Main CPU Peripheral Circuits
			Defective R15		Replace R15	
			Defective BZ1		Replace BZ1	

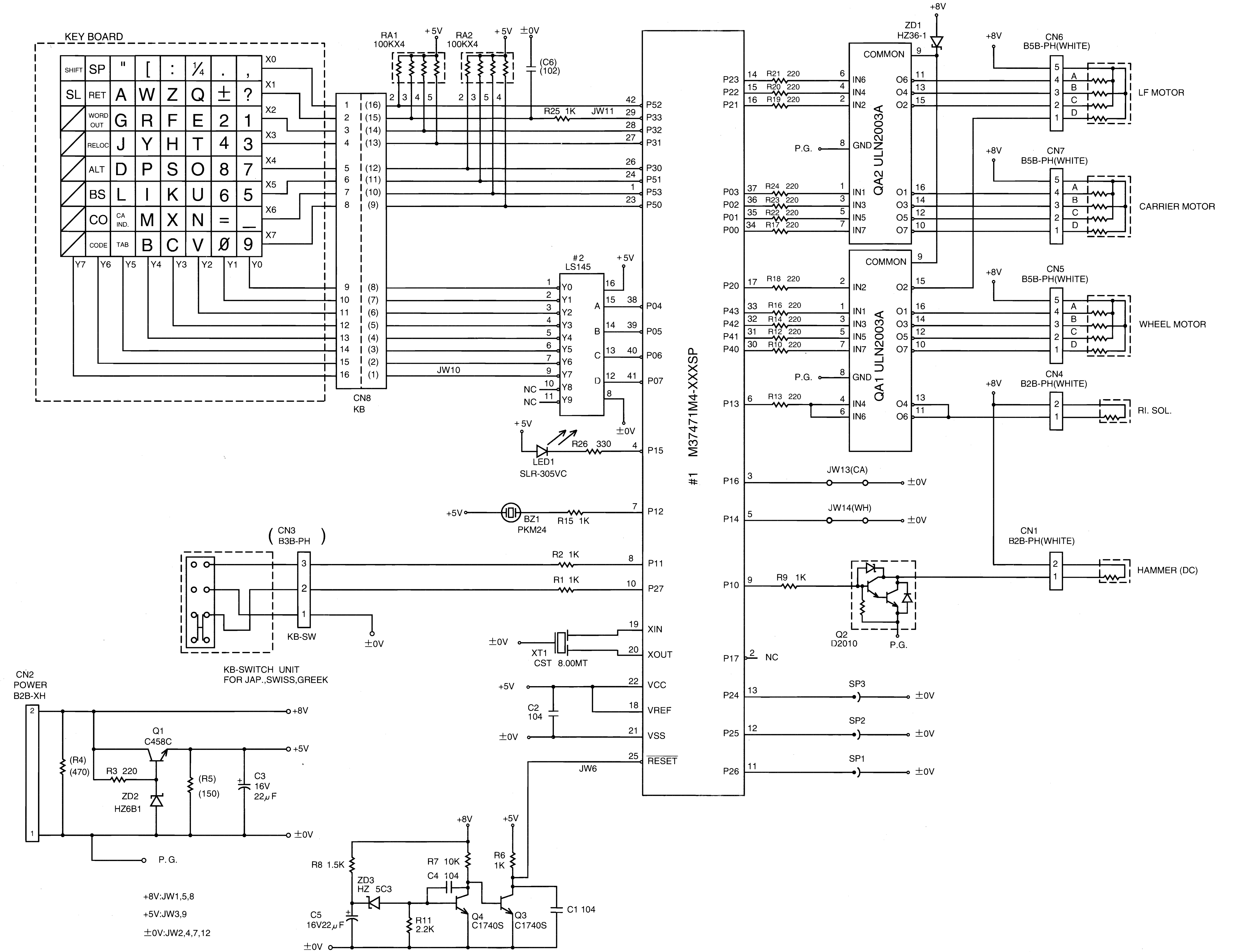


Fig. 1.32 Main PCB circuit schematic diagram

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